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Bibliography on Thunderstorm Sferics

Vol. 4 November, 1953 No. 11

# METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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# METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 4 NOVEMBER, 1953 No. 11

AGRICULTURE · COMMERCE · AERIAL AND MARINE NAVIGATION · PUBLIC HEALTH · INDUSTRY · ENGINEERING
AMERICAN METEOROLOGICAL SOCIETY
1919

## SPECIAL FEATURE IN THIS ISSUE

A Selective Annotated Bibliography on Thunderstorm Sferics

(*For complete table of contents see back cover*)

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# FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to bring to the attention of meteorologists current literature in their field and in related fields and to provide bibliographic information on various subjects, as interest demands.

Part I contains from 175 to 300 abstracts of current periodical literature and monographs in the fields of meteorology, hydrology, oceanography, etc. These abstracts are arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of from 50 to 250 important references on a special subject without respect to recency of material. No attempt is made to prepare exhaustive bibliographies; instead, the aim is to include a representative cross section of the various aspects of a subject. Preference is given to recent material, comprehensive works, material from obscure sources, and items with good bibliographies.

Bibliographies previously published were:

| No. Mo. | Vol. I, 1950 | Vol. II, 1951 | Vol. III, 1952 |
|---|---|---|---|
| 1. Jan. | **Atmospheric Pollution** | **Extended Forecasting** | **Climate—Northwest Africa** |
| 2. Feb. | **Aerobiology** | **Long Range Forecasting** | **Carbon Dioxide** |
| 3. March | **Cloud Physics** | **Soil Temperature** | **Climate—Argentina, etc.** |
| 4. April | **Hail** | **Constants, Tables, etc.** | **Dew** |
| 5. May | **Tornadoes** | **Climate—Near East** | **Objective Forecasting** |
| 6. June | **Volcanic Dust** | **Climate—Middle East** | **Stratus Forecasting** |
| 7. July | **Climatic Changes** | **Special Winds** | **Urban Climatology** |
| 8. Aug. | **Thunderstorms** | **Radar Storm Detection** | **Climate—Central Africa** |
| 9. Sept. | **Icing** | **Condensation Trails** | **Visibility** |
| 10. Oct. | **Acoustical Propagation** | **Climate—Northeast Africa** | **Glaze and Rime** |
| 11. Nov. | **Evaporation** | **Mountain Meteorology** | **Free Air Turbulence** |

Bibliographies published this year are:

1. **Turbulence Theory,** Vol. IV, No. 1, Jan. 1953
2. **Turbulent Diffusion and Exchange,** Vol. IV, No. 2, Feb. 1953
3. **Frost and Frost Forecasting,** Vol. IV, No. 3, March 1953
4. **Climate of Australia and New Zealand,** Vol. IV, No. 4, April 1953
5. **High Level Winds (500–100 mb),** Vol. IV, No. 5, May 1953
6. **High Level Winds (above 100 mb),** Vol. IV, No. 6, June 1953
7. **Jet Stream,** Vol. IV, No. 7, July 1953
8. **Radiation Bioclimatology,** Vol. IV, No. 8, Aug. 1953
9. **Climatology and Marine Meteorology of the Pacific,** Vol. IV, No. 9, Sept. 1953
10. **Auroras,** Vol. IV, No. 10, Oct. 1953
11. **Sferics,** Vol. IV, No. 11, Nov. 1953

Other bibliographies in preparation are:

*Actinometers*
*Arctic Meteorology*
*Auroral Physics*
*Climate of Southeast Asia and the East Indies*
*Machine Methods in Meteorology*
*Microwave Propagation*
*Oceanographic Meteorology*
*Ozone*
*Radiation Data*
*Snow Cover*
*Tropical Cyclones*
*Tropopause Variations*

Part III contains a listing of the contents of those journals which are primarily meteorological. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue cumulative author, subject, geographical and journal indexes are published.

# EXPLANATIONS

**Location of material:** For each entry, a symbol is given for at least one library where th material may be found. The Union List of Serials (Gregory) is the source of most of th symbols used. In some cases, where no symbol has been assigned to a library, one will b devised according to the principles of the Union List.

**Library symbols** used frequently may be found in the following list:

| | |
|---|---|
| DA: | U. S. Dept. of Agriculture Library, Washington, D. C. |
| DBS: | U. S. Bureau of Standards Library, Washington, D. C. |
| DGS: | U. S. Geological Survey Library, Washington, D. C. |
| DLC: | Library of Congress, Washington, D. C. |
| DSG: | U. S. Army Medical Library, Washington, D. C. |
| DSI: | Smithsonian Institution Library, Washington, D. C. |
| DWB: | U. S. Weather Bureau Library, Washington, D. C. |
| GB-MO: | Great Britain, Meteorological Office Library, Harrow, England. |
| MH-BH: | Harvard University, Blue Hill Observatory (and American Meteorologica Society) Library, Milton, Mass. |
| NN: | New York Public Library, New York, N. Y. |
| NNA: | American Geographical Society Library, New York, N. Y. |

**Other symbols:**

| | |
|---|---|
| * | before an entry indicates a good data source. |
| † | before an entry indicates a good bibliography. |
| § | before an entry indicates a synoptic case history study accompanied by chart |

**Geographic locations** are in the English form rather than the form used locally, for exampl Moscow for Moskva.

**Titles of articles or monographs** are in the language of the original article unless otherwi stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to th Library of Congress transliteration scheme.

**Abbreviations:**

*Titles of periodicals* are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months a abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numb (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus a entry will read as follows:

*Meteorologische Rundschau*, 2(5–6):146–151, May–June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vo 2), *Heft* 5–6 (No. 5 and 6), *pages* 146–151, May–June 1950.

# PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

## WORKS OF SPECIAL INTEREST

4.11–1 551.5(98):016

Arctic Institute of North America, **Arctic bibliography.** Prepared for and in cooperation ith the Department of Defense, under the direction of the Arctic Institute of North America. Marie Tremaine (*ed.*)] Wash., D. C., Govt. Print. Office, **1953.** 3 v. 4478 p. Index map old. in back of each volume. Price: $12.75. **DLC**—This tremendous 3 volume work has een 6 years in preparation. The 4478 pages include citations (with brief descriptive abstracts n most cases) of 20,000 articles or books covering all fields of Arctic science, arranged alhabetically by author, and in addition (in v. 3) a very thorough subject and geographic lace index, containing over 100,000 references and cross references, arranged under 18,000 eadings (both by area under subject and subject under area). The geographic headings efer to the exact place as well as to the region, if appropriate. The merits of the system of ntry of author, original title, serial, translated title (into English), transliteration scheme, ource of material (library where copy was seen), list of 1300 serials, etc. as well as of the inexing system cannot be touched on here, but, needless to say, all are patterned according to he best bibliographic style and library practice, and the style of printing, entry, etc. are qually excellent. Owing to years of patient checking and rechecking, the accuracy of the ntries, translations and indexing, too, is remarkably high for a compilation containing material n so many foreign languages (about 60% of the material is Russian, Scandinavian or German). There are over 1000 items indexed under **Meteorology** and its subject and geographic subivisions, 500 under **Climatology,** and scores of hundreds of items under: Air temperature, Atmospheric pressure, Auroras, Climatic changes, Clouds, Cyclones and anticyclones, Evapration, Fog, Frost, Humidity, Ionosphere, Microclimate, Oceanography, Permafrost, Preipitation, Snow, Solar radiation, Upper air winds, Wind. In fact at least 25% of the articles re of interest to meteorologists or climatologists—one can scarcely find a page that does not ontain some item of interest—and the annotations are informative and readable. Regionally, he material covers most of Siberia, Lapland, Northern Canada, all of Alaska and Greenland, he Arctic Ocean, Labrador but, for some strange reason, not Iceland. A large folded map n each volume shows the general regions (69 of them). The work represents a broad coperative effort on the part of the various branches of the Dept. of Defense, the Library of Congress, Arctic Institute, Smithsonian Institution and the Canadian Government, as well as he untiring work of Miss Tremaine, the director, Miss Mary Grier and many others. It s gratifying to note that many items have been taken from *Meteorological Abstracts* (with lue credit given). Two more volumes are in preparation—Vol. IV, now in press, contains 7700 references to 1950–52 and earlier material stressing articles in the fields of medicine, ealth, environmental adaptation and native peoples. Vol. V, to appear late in 1954, will ontain similar material through 1953. All in all, Miss Tremaine is to be complimented on erforming a monumental task of organizing, indexing and making available the literature of centuries of Arctic research and exploration. Nothing like it has ever appeared in any ield of natural science. *Subject Headings:* **1. Arctic bibliographies 2. Arctic climatology 3. Arctic meteorology. I. Tremaine, Marie** (*ed.*) **II. U. S. Dept. of Defense.**—*M.R.*

4.11–2 551.558.1:551.576.11

†Ludlam, F. H. and Scorer, R. S., **Reviews of modern meteorology—10. Convection in the atmosphere.** *Royal Meteorological Society, Quarterly Journal,* 79(341):317–341, July **1953.** 2 figs., 65 refs. **DWB**—Authors aim at "a unified picture of what happens during the process of convection" and summarize much recent research. They deal first with slow convection, instability resulting in cellular patterns (compared with laboratory experiments), transverse

rolls or billows and mammatus in which motion is downwards in the middle. For thermals the bubble theory with amalgamation of wakes is preferred to the chimney theory. Influence of shearing and source of warm air are considered, importance of high ground being emphasized. Types of motion are described: streets, stable rotating thermals (e.g., dust devils, waterspouts), compensating down currents vs. removal of air by sonic disturbance, and the phenomena of sea breezes and the sea breeze front. The formation of Cu is studied including limitation of of height of small single-bubble Cu by mixing with clear air. Large Cu are regarded as a chaotic assemblage of bubbles (turrets) and their wakes; measurements of temperature and updraft are quoted in relation to cloud-top height and maintenance of convection. Finally, authors discuss Cu formation over oceans, diurnal variation of convection and forecasting Cu. *Subject Headings:* **1. Convection 2. Cloud formation 3. Cumulus cloud formation 4. Review articles.**—*C.E.P.B.*

4.11–3 551.574.1

McDonald, James E., **Theoretical cloud physics studies.** Iowa State College. Physics Dept., Contract Nonr757, T.O.(00), Project NR 082 093, Final Report, Jan. 31, **1953.** 105 p. figs., tables, eqs., bibliog. p. i–vi (following p. 105). Mimeo. **DWB**—This report contains 4 studies, each complete in itself, including an abstract summary and suggestions for future research. The first and longest treatise, entitled "Homogeneous nucleation of supercooled water drops," develops the theory needed to explain the spontaneous freezing of supercooled water drops at −38°C to −41°C, as distinguished from heterogeneous freezing at higher temperatures, such as is found on aircraft flying through supercooled clouds, or in artificial nucleation of clouds. The theory gives −26°C as the probable temperature of homogeneous freezing, but this is thought to be close enough to −40°C to verify the theory. The second paper "On the electrical conductivity of the lower stratosphere" discusses the cause of the sudden decrease in conductivity (as evidenced by an increase in field intensity) at 19–22 km discovered in the Explorer II balloon flight into the stratosphere in 1935. This was thought by many writers to be an anomalous occurrence, but the same effect was reported in 1926 by IDRAC as a result of balloon soundings on one day in June 1926 at Trappes, France. An hypothesis that this phenomenon is caused by the convective updraft of Aitken nuclei into the stratosphere seems insufficient to produce a uniform increase in nuclei and resulting charged layer throughout the earth. Further soundings are recommended to shed light on the question. The third study entitled "A note on erroneous cloud physical applications of Raoult's law," shows that a consistent error of as much as 191% (for NaCl) has been made in estimating the decrease in vapor pressure of cloud drops due to the presence of dissolved substances (cf. HOWELL 1949 and others). Study number IV is entitled "The shape and aerodynamics of large raindrops." The physical factors of surface tension, hydrostatic pressure, external aerodynamic pressure, electrostatic charge and internal circulation which might control shape of large raindrops are discussed and the conclusion reached that the first 3 are the only important factors in producing deformation. A single but excellent drop photograph obtained by DR. C. MAGONO of Hokkaido Imperial University (furnished by DR. U. NAKAYA) is used to calculate forces and test theory. Numerous schematic diagrams and derived data are presented to show that separation of airflow around a drop affects its shape and hence the physical processes around the drop when falling. *Subject Headings:* **1. Cloud physics research 2. Spontaneous freezing 3. Electrical conductivity in stratosphere 4. Condensation nuclei 5. Raindrop distortion. I. Iowa State College. Physics Dept. II. Contract Nonr757, T.O. (00).**—*M.R.*

4.11–4 551.521:523.7:06

Conference on the Sun in the Service of Man, Feb. 24–25, 1951, Boston, [**Proceedings**]. *American Academy of Arts and Sciences, Proceedings*, 79(4):181–326, July **1951.** Price: $2.50. **DWB**—The papers delivered at this conference review present day knowledge on the biological utilization of solar energy through photosynthesis in lower plants, in agricultural crops and in forests on the effect of the sun upon the earth's atmosphere, ionosphere and other meteorological factors; and on the energy resources of the world and the transformation and utilization of solar energy. *Subject Headings:* **1. Sun 2. Photosynthesis 3. Solar radiation 4. Global radiation 5. Conferences.**—*I.L.D.*

4.11–5 551.593.53:551.521.31

*Bullrich, K., de Bary, E. and Möller, F., **Die Farbe des Himmels.** [The color of the y.] *Geofisica Pura e Applicata*, 23:69–110, 1952. 12 figs., 13 tables, 32 refs. English mmary p. 70. **MH-BH**—The first comprehensive and detailed study in this field, filling gap in meteorological research, according to the authors. BULLRICH writes on the theory primary scattering, utilizing new results of JUNGE, regarding mainly the distribution law of mospheric aerosol particles (*see item* 3.11–177, Nov. 1952, *MAB*). A detailed discussion devoted to the extinction due to haze and its dependence on wave length. A table is pre- nted giving the extinction coefficient of the whole atmosphere with varying haze content. ne scattering function of the combined Rayleigh and haze atmosphere is derived and tabu- ted, and the sky radiation function for each point of the sky given. DE BARY presents mputation results of the primary sky variation, gives detailed auxiliary tables for this rpose and shows the dependence of the sky radiation on the optical air mass, on the scattering d relative intensities. The absolute intensity of primary sky radiation depending on wave ngth, zenith distance and haze content is tabulated on pp. 88–89. Another table gives the ve length of the corresponding color tone of the sky, the color saturation and brightness. ÖLLER discusses the influence of multiple scattering on the color of the sky which is im- rtant to consider, because the sky in zenith is still blue at sunset or sunrise, while the theory primary scattering gives a green color. In order to solve this extremely difficult theoretical oblem, the author reduces the radiation fluxes coming from all directions down and up eflection from the ground) to two vertical radiation fluxes. The integral for multiple scatter- g is given on p. 98 and tabulated on p. 99–100 for the zenith-distance 60° and the ground edo 0.20. Furthermore, the author discusses the direct computation of secondary scatter- g in great detail and shows the differences in color computed by the three methods (p. 109). *bject Headings:* **1. Skylight color 2. Scattering of light 3. Haze.**—*A.A.*

4.11–6 551.511(02)

Čadež, M., **Fizika atmosfere.** [Physics of the atmosphere. Pt. I.] Belgrade, Hidro- eteoroloska Služba, 1952. 200 p. 179 figs., eqs. In Croatian. **DWB**—A didactic treat- ent of the various aspects of physical and dynamic meteorology that have to do with atmos- eric composition, structure, thermodynamics, condensation, evaporation, wind turbulence, iabatic processes, convergence, divergence, vorticity, etc. The purpose of the work is to ovide the student with enough theoretical background to understand the operations in noptic analysis and forecasting. The text is liberally provided with original schematic agrams and illustrative meteorological charts in addition to the standard mathematical velopments found in modern textbooks on dynamic meteorology. *Subject Headings:* **Dynamic meteorology 2. Synoptic meteorology 3. Croatian language 4. Textbooks.**— *R.*

4.11–7 551.577.2(481)

*Godske, C. L. **The distribution of precipitation in Hardanger.** *Bergen. Universitetet. bok* [*Avhandlinger og Arsberetning*] *Naturvitenskapelig Rekke*, No. 10 **1952** (pub. March 53). 5 tables 57 figs. 7 refs. Bergen. Universitetet. Studies in local meteorology and presentativeness, I. **DWB**—An elaborate study based on a dense network in the region -60.5°N, 6–7°E. operated during the summers of 1945 and 1946. Local distribution of ecipitation is analyzed for different weather situations (wind directions), discussing especially e effect of "rain shadows." Daily and monthly isohyets are drawn for numerous selected uations. The representativeness of precipitation stations is studied by means of maps owing the distribution of association and correlation coefficients in regard to two permanent tions. Data are given for number of days with precipitation as well as monthly means the whole network. *Subject Headings:* **1. Precipitation distribution 2. Climate of Norway Hardanger, Norway.**—*A.A.*

4.11–8 551.508.79 551.574.42(433)

†*Grunow, Johannes, **Kritische Nebelfroststudien. Nach Beobachtungen auf dem Hohen- issenberg.** [Critical studies of rime. From observations on Hohenpeissenberg.] *Archiv Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 4(4):389–419, **1953.** 9 figs., 9 tables,

27 refs. German, English and French summaries p. 389–390. **DWB**—Rime makes an important contribution to the water economy of mountain regions. Methods of measurement are reviewed and it is found by experiment that the ratio of amount collected by cylinders or spheres to possible amount is a function of diameter of collector as well as of wind speed. All measurements are relative. A collector in the form of a net is described; it is regarded as better than a solid body. Definitions and origin of Rauhreif (crystalline), Rauhfrost (amorphous), Rauheis (smooth opaque ice) and Glatteis (clear ice) are discussed. Rime deposits on Hohenpeissenberg are described, with beautiful photographs; frequency and associated temperature, wind and synoptic situation are tabulated. *Subject Headings:* **1. Rime collectors 2. Rime deposits 3. Definitions 4. Hohenpeissenberg, Germany.**—*C.E.P.B.*

4.11–9 551.578.41(234.3)

†*Hoeck, Erwin, **Der Einfluss der Strahlung und der Temperatur auf den Schmelzprozess der Schneedecke.** [Influence of radiation and temperature on the melting process of snow cover.] *Beiträge zur Geologie der Schweiz, Geotechnische Serie, Hydrologie*, No. 8, **1952.** 36 p. 22+ tables (some fold.), 22 figs., 36 refs., eqs. **DWB**—One of the best monographs on the melting of snow. The heat balance, retention and melting depth of snow cover are discussed with special emphasis on the effect of season, height, cloudiness, exposure, slopes and forests on the radiation balance. The snow albedo depends on temperature. Furthermore it is shown how to use standard meteorological data (as temperature and humidity) in order to evaluate the melting process. Computed runoff shows good agreement with observed values. Numerous tables and graphs facilitate the computation of the radiation balance, and give the basic data accumulated at numerous stations. *Subject Headings:* **1. Snow physics 2. Snow melt 3. Runoff forecasting 4. Switzerland.**—*A.A.*

4.11–10 551.481.1:551.579

†*Hofer, Fritz, **Über die Energieverhältnisse des Brienzersees.** [The energy conditions of Lake Brienz.] *Beiträge zur Geologie der Schweiz, Geotechnische Serie, Hydrologie*, No. 7, **1952.** 95 p. 4 figs., 8 diagrs. (1 fold.), 18+ tables, 3 photos., bibliog. p. 93–95. English summary p. 91–92. **DWB**—One of the most comprehensive monographs on a single lake. In the hydrological part, precipitation, evaporation, water level variations, in- and outflow and a single flood in 1948 are thoroughly treated. Estimated annual evaporation is 800 mm. Vertical and horizontal heat distribution and daily and annual temperature variations are analyzed computing heat content, stability and heat balance. Wind effects on currents and optical characteristics of the lake were also studied. Elaborate graphs and illustrative tables are distributed profusely throughout the text. *Subject Headings:* **1. Limnology 2. Hydrologic cycle 3. Heat balance of lakes 4. Lake Brienz, Switzerland.**—*A.A.*

4.11–11 551.577(82)

*Marchetti, Adolfo A., **Estudio des régimen pluviométrico de la República Argentina.** [Study of the rainfall regime of Argentina.] *Meteoros*, Buenos Aires, 2(3/4):243–309, July–Dec. **1952.** 15 figs., 17 tables. English summary p. 243. **DWB**—An excellent statistical study of precipitation in Argentina including geographic distribution, annual and monthly variation in amount, frequency and intensity, extreme values, variability at one station, greatest amount in one day, skewness of rainfall distribution, duration of wet and dry spells and frequency of same, probability of one or more wet days being followed by one more wet day, etc. The study is based on data from 67 pluviometric stations (many in northern Argentina and few in Patagonia) for the period 1905 to 1946 (42 years approx.). An unusual amount of statistical data, graphs, isohyetal and frequency charts and statistical calculations are presented. *Subject Headings:* **1. Precipitation data 2. Statistical studies 3. Climate of Argentina 4. Argentina.**—*M.R.*

4.11–12 551.584.41(02) 551.588.6(02)

Richards, P. W., **The tropical rain forest. An ecological study.** Cambridge, Eng., Univ. Press, **1952.** 450+p. 19 figs., 39 tables, refs. **GB-MO**—The Introduction includes the biological spectrum and the distribution of rain forest (with map) and past changes. Pt. I deals with the structure, Pt. II, Environment, Pt. III, Composition, Pt. IV, Primary succes

ions, Pt. V, Tropical rain forest under limiting conditions, and Pt. VI, Effect of human action. n Pt. II (p. 136–230) one chapter describes the macroclimate, climatic boundaries, and physiological effects; another "Microclimates" including air motion, interception of precipitation, temperature and humidity (illustrated by "hythergraphs"), light and $CO_2$; others deal with seasonal changes and soil conditions. There are numerous climatic tables and graphs; those for microclimates are of especial interest. *Subject Headings:* **1. Forest ecology 2. Textbooks 3. Tropics.**—*C.E.P.B.*

4.11–13 551.525.5:016 551.578.4:016 551.588.5:016

†U. S. Snow, Ice and Permafrost Research Establishment, **Annotated bibliography on snow, ice and permafrost.** *U. S. Snow, Ice and Permafrost Research Establishment, SIPRE Report,* No. 12, v. 3 and 4, Jan., July **1953.** Cumulative subject index to v. 1–4 in v. 4, p. 330–360. **DLC**—The third and fourth volumes of the SIPRE bibliography contains 1600 references and abstracts, an author and a subject index, on articles concerning all phases of snow, ice, frost and freezing processes in the earth, on water surface and in the air. Arctic engineering problems are also emphasized. The bibliography is produced by photo-offset of the SIPRE library cards which are layed out about 6 to a page. The elaborate subject index must be used to locate items on any subject area. Material is mostly for the period 1930 to date, with emphasis on current material. It is issued semi-annually, each issue representing the current accumulation of printed cards. *Subject Headings:* **1. Snow, ice and permafrost bibliographies 2. Arctic engineering. I. U. S. Library of Congress.**—*M.R.*

## GENERAL METEOROLOGY

*See also:* **Arctic bibliography** (Arctic Inst. of N. America), **4.11–1.**

4.11–14 551.5(02

†Constantino, Carlos E., **Meteorología descriptiva. Análisis animado de todos los procesos meteorológicos que interesan al hombre de tierra y de mar.** [Descriptive meteorology. An illustrated analysis of meteorological processes of interest to man on land and sea.] Buenos Aires, Ed. Sopena Argentina, **1943.** 485 p. 138 figs., 11 tables, plates, bibliog. p. 463. **DLC**—A voluminous yet fairly simple coverage of the many aspects of meteorology as it was at the time of the Second World War. Chapters cover: I. History and general structure and composition of the atmosphere; II. Heat (radiation, actinometry, temperature, soil and sea temperature); III. Pressure and general circulation, air masses, wind (with special application to Argentina); IV. Water vapor (thermodynamic processes, clouds, evaporation, precipitation, sunshine, cloud physics, snow and hail); V. Local circulation of atmosphere (cyclonic storms, tropical cyclones, tornadoes, etc.); VI. Aerology (balloon and radiosondes, service for aviation, the stratosphere, auroras, atmospheric electricity, optical and acoustical phenomena); VII. Tropical and Polar air masses and fronts; VIII. Meteorological services, map analysis and forecasting (especially that in Argentina); IX. Cloud systems, their observation and use in forecasting; X. Climate with respect to latitude, continentality and life on earth—the last chapter is very brief for such a broad subject. A number of standard reduction and conversion tables are appended. The schemes, diagrams and charts are ordinary, but some excellent illustrations of the latest meteorological instruments are inserted in each chapter as glossy prints. These are mainly of Negretti and Zambra, or Friez construction. Most chapters given examples or illustrations of conditions in South America for special application to Argentina with emphasis perhaps on marine meteorology (the author was a Navy Lieutenant but was closely connected with the Meteorological Society of Argentina). *Subject Headings:* **1. Meteorology 2. Marine meteorology 3. Textbooks 4. Argentina.**—*M.R.*

4.11–15 551.5(05)

East Africa High Commission. Meteorological Dept., **Technical Memorandum.** No. 1, **1952.** 5 p. fig., tables. Foreword by the Director of the East African Met. Dept. Price: 5shs. 2/50. **DWB**—New series of publications of the Meteorological Department. Serves to fill a gap between its "Memoirs" (major contributions) and its "Pamphlets" (account of

weather conditions). *Subject Headings:* **1. Serial publications 2. British East Africa.** **Davies, D. A.**—*A.A.*

4.11–16 551.5(98/9) 91.04(98/9

**25 Jahre Archiv für Polarforschung.** [25 year "Archiv für Polarforschung."] *Polar forschung*, 3(2):81–126, **1951. DWB**—Report of the Jubilee meeting of the Archiv für Polar forschung, Kiel, June 18–20, 1951, with reports by D. EYSSEN, Voyage with the auxiliar cruiser "Komet" 1940/41 through the Siberian route and the Antarctic; HERRMANN, Ic conditions and some experiences on expeditions; R. HOLZAPFEL, German polar investigatio 1940–45 (p. 85–97, including arctic voyages of weather ships and account of unmanned stations 21 refs.); ABS, Polar medicine (p. 97–106, 39 refs.); STAUBER, Geological investigations i the fiord region of NE Greenland; MATTICK, Importance of lichen investigations for pola research; BAUER, French polar expeditions in Greenland 1948/51 and Adélie Land 1948/52 RITSCHER, German Schwabenland expeditions 1938/39; KRUMBIEGEL, Biological possibilitie of settlements in the Antarctic; KOSACK, Proposal for a new chart of the Antarctic. *Subjec Headings:* **1. Polar expeditions 2. Archiv für Polarforschung, Kiel 3. Arctic 4. Antarctica.**— *C.E.P.B.*

4.11–17 551.5:06(26)(45

**L'organizzazione del servizio meteorologico a bordo delle navi mercantili italiane.** [Or ganization of the meteorological service of the Italian Merchant Marine.] *Geofisica Pura Applicata*, 21:127–130, 1952. English summary p. 127. **MH-BH**—Describes the meteoro logical service of the Italian Merchant Marine organized after Jan. 1, 1950 by the Istitut Idografico di Genova, according to the resolutions of the Meteorological Conference, Wash ington 1947. The actual effort to overcome the difficulty of some observations at sea i emphasized. *Subject Headings:* **1. Marine meteorological services 2. Italy.**—*Author' abstract.*

4.11–18 551.5:621.396.1

Kiely, D. G., **Some measurements of fading at a wavelength of 8 mm over a very shor sea path.** *Baldock, Hertfordshire. Services Electronics Research Laboratory, S.E.R.L. Technica Journal*, 3(1):15–18, March **1953.** 2 figs., table, 3 refs. Mimeo. **GB-MO**—A one-way link one mile long was set up across Loch Goil, Scotland, transmitter 15 ft above MSL, receive 100 ft, to investigate superrefraction on 8 mm wave length. Very large fluctuations of signa strength were associated with weather changes and attributed to a surface or elevated duct *Subject Heading:* **1. Short wave radio transmission.**—*C.E.P.B.*

4.11–19 551.5:63(05)

*Hamburg. Seewetteramt, **Die Witterung im Übersee.** [Weather conditions overseas. v. 1, No. 1, Jan. **1953.** Monthly. Price: DM 20 per year. **DWB**—New periodical; first number contains four pages. Routine feature: monthly review of weather conditions in each continent, paying special attention to large agricultural regions. A world map characterizes temperature and precipitation anomalies (no information for Soviet Union and China). Data are given for 40 selected stations. Graphs show the march of anomalies during the last yea for the main wheat, cotton, coffee, corn, jute and bast fiber regions. Periodical is currently issued as rush information for the business man, willing to pay the high price for easily under stood, concise information. The specialist would prefer the "Monthly climatic data for the world," issued by the U. S. Weather Bureau, which contains considerably more data. *Subjec Headings:* **1. Periodicals 2. Climatic data 3. Agricultural meteorology. I. Germany. Deutscher Wetterdienst.**—*A.A.*

4.11–20 551.5:63

Rubiato, J. M., **Meteorology and agriculture.** *World Meteorological Organization, WMO Bulletin*, 2(1):13–18, Jan. **1953. DWB**—The author develops the idea that agricultural meteorology is a vital field of endeavour, having the three elements of truth: 1) necessity 2) permanence and 3) universality which can be easily demonstrated. Examples are given

The need of the agriculturist for meteorological knowledge and forecasts, the continuing tudy and application during the past 2 centuries and the fact that every country as well as he WMO itself recognizes the need for study and application of climatic and meteorological lata to a broad variety of economic and agricultural problems is discussed in some detail. The work of the IMO Commission on Agricultural Meteorology is reviewed. *Subject Heading:* **. Agricultural meteorology.**—*M.R.*

4.11–21 551.5:92

**K 60-letiiu B. P. Alisova.** [On the 60th birthday of B. P. Alisov.] *Vsesoiuznoe Geo-raficheskoe Obshchestvo, Izvestiia,* 84(4):399, July/Aug. **1952. DWB**—Boris Pavlovich Alisov, professor of climatology in the faculty of geography of Moscow University, was born n March 22, 1892. His scientific career is outlined and his major contributions to climatology re mentioned: "Dinamiko-klimatologicheskii analiz v prilozhenii k zadacham chastnoi limatologii," 1936 (Dynamic climatic analysis as a supplement to special climatology); "Geograficheskie tipy klimatov," 1936 (Geographic types of climates); "Kurs klimatologii," 940 (Course of climatology); and "Klimaticheskie oblasti zarubezhnykh stran," 1951 (Cli-natic regions of foreign countries). *Subject Headings:* **1. Biography 2. Alisov, Boris Pavlo-ich.**—*I.L.D.*

4.11–22 551.5:92

**Mr. E. G. Bilham, B.Sc., D.I.C.** *Meteorological Magazine,* London, 82(973):193-194, uly **1953.** photos. **MH-BH**—Joined British Meteorological Office April 1915. Worked t Kew Observatory, Benson Aerological Observatory, and then in Instruments, Climatology nd Forecasting Divisions; Deputy Director (Forecasting) since 1947. Retired May 30, 1953. Vrote numerous papers, "The climate of the British Isles" (1938) and "Here is the weather orecast" (1947). *Subject Headings:* **1. Biography 2. Bilham, E. G.**—*C.E.P.B.*

4.11–23 551.5:92

Radošević, Milušin Dj., **Milan Nedeljković.** [Obituary. Milan Nedeljković.] *Yugo-lavia. Hidrometeorološka Služba. Hidrometeorološki Glasnik, 3*:92–94, **1950.** In Croatian. **DWB**—Dr. Milan Nedeljković (1857–1950), university professor and founder of the eteorological observatory at the University of Belgrade, had a decisive part in the develop-ent of the Serbian meteorological services. He studied and practiced meteorology and stronomy in France and became professor of meteorology and astronomy at Belgrade in 886. The observatory founded and conducted by him started meteorological research in 887 and was soon reinforced by a network of meteorological stations. From 1903 Dr. Nedeljković edited a monthly meteorological bulletin which was highly commended through-ut the scientific world of that time. Titles of his papers and books are quoted. *Subject Teadings:* **1. Nedeljković, Milan 2. Biography 3. Bibliographies 4. Obituaries.**—*G.T.*

4.11–24 551.5:92

Trumpy, B., **Odd Dahl, den förste doctor honoris causa ved universitetet i Bergen.** Odd Dahl, the first honorary doctor at the University in Bergen.] *Naturen,* 76(10):290–293, **952.** photo. **MH-BH**—His doctorate was awarded on May 7, 1952 for merit in nuclear hysics research. As a pilot with the Roald Amundsen Polar Expedition (1923–1926) he ade the first polar flight and landing (75°N) and constructed and built several oceanographic, eric and meteorological instruments for H. U. Sverdrup's investigations. During 1926–935, while working at the Carnegie Institute of Washington, along with Hafstad and Tuve e was honored by the American Association for the Advancement of Science with its prize of 930–1931 for the best scientific work of the year, "Producing high speed protons and tracing eir paths." *Subject Headings:* **1. Biography 2. Dahl, Odd.**—*W.N.*

4.11–25 551.5:92

†Wadati, Kiyoo, **In memory of Prof. Dr. Sakuhei Fujiwhara.** *Geophysical Magazine,* okyo, 22(4):279–281, Aug. **1951. MH-BH**—Born Oct. 29, 1884; died Sept. 22, 1950. tudied theoretical physics at Tokyo University. From March 1924 professor at the same niversity. From March 1941 director of the Central Meteorological Observatory. Number

of original papers approximately 200. A list of published papers and books is added on pag 345–353. *Subject Headings:* **1. Biography 2. Bibliographies 3. Fujiwhara, Sakuhei.**—*A.A*

# METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

## METHODS OF OBSERVATION

*See also:* **Recirculating apparatus for testing hygrometers** (Wexler), 4.11-65; **Estimation of mean air temp. (geographical proportional method)** (Nishiuchi), 4.11-156; **Hydrometeorological log at Central Sierra Snow Lab., 1950–51,** 4.11–229; **Immediate recognition of sky light polarization** (Wöhlisch), 4.11–274.

4.11–26 551.501:551.574

Gendron, Pierre R. (*Univ. of Montreal, Canada*), **Droplet size distribution in aerosol** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 13:101-10 May **1952.** 3 figs., 6 refs., 2 eqs. Discussion p. 107. **DWB**—An investigation was carri on in the laboratories of Columbia University, New York and consisted in the application a improvement of three different techniques, namely, 1) GORDLIEYEFF's photography of aeros deposited by thermal precipitation on glass plates under an electron microscope, 2) CHANEY photography of suspended droplets and 3) the differential settling technique developed SINCLAIR and LA MER. All three techniques were found to be workable. *Subject Heading* **1. Drop size distribution measurement 2. Aerosols. I. Colloquium on Microwave Meteo ology, Aerosols and Cloud Physics.**—*G.T.*

4.11–27 551.501:551.578

Gerdel, Robert Wallace (*Snow, Ice & Permafrost Res. Est. Wilmette, Ill.*), **Snow therm dynamics offers better understanding of mechanical properties of snow.** *Civil Engineerin* N. Y., 22(12):46–48, Dec. **1952.** photos. **DWB**—Short general review on some of t scientific activities of the Snow, Ice and Permafrost Research Establishment (SIPRE) at t Central Sierra Snow Laboratory (micrometeorological and special snow observations) and Wilmette (laboratory research). Photos show location of instruments. Radiometer for t measurement of net exchange of radiant heat between sky and snow located at a roof in t immediate vicinity of a mast. *Subject Headings:* **1. Snow research laboratories 2. Instrume exposure 3. Snow, Ice and Permafrost Research Establishment (SIPRE).**—*A.A.*

4.11–28 551.501:551.577

Pelzl, E. and Antonik, Bertold, **Zur Vergleichbarkeit der Niederschlagswerte von Sachs vor 1935 mit den Werten der angrenzenden Gebiete.** [On the comparability of the rainf values for Saxony before 1935 with those for neighboring regions.] *Germany. Deutsch Wetterdienst in der US-Zone, Berichte,* No. 42:169–171, **1952.** 2 figs., 5 refs. **DWB**—T Schreiber rain gage used in Saxony before 1935 receives 10% more than the Hellmann gag This is supported by charts of % difference, 1936/40 from 1891/1930. *Subject Heading* **1. Rainfall data analysis 2. Saxony.**—*C.E.P.B.*

4.11–29 551.501:551.591 551.5

Stewart, K. H., **Fog investigations.** *Meteorological Magazine,* London, 82(973):213-21 July **1953.** 2 refs. **MH-BH**—Fog investigations by British Meteorological Office are d scribed: 1) methods of measuring visibility at airfields, including slant visibility, to meet nee of pilots at night; 2) investigations at Cardington into physics and forecasting of fog, usi apparatus hung from a balloon at 4000 ft; 3) investigation of London fog, Dec. 1952. T discussion centered on importance of slant visibility and the effect of smoke. *Subject Heading* **1. Visibility measurement 2. Slant visibility 3. Fog.**—*C.E.P.B.*

4.11–30 551.501:551.573:551.579

Popov, O. V., **Soveshchanie po voprosam metodiki nabliudenii nad ispareniem s pochv** [Conference on the methods of observation of soil evaporation.] *Meteorologiia i Gidrologi* No. 7:51–53, **1952. DLC**—The Hydrometeorological Service of the U.S.S.R. called on Mar

8–20, 1952 a special conference to discuss this problem. Five special reports were presented by the State Hydrological Institute, Central Geophysical Observatory and Central Institute of Weather Forecasting. The Hydrological Institute carried out experiments at special stations. Evaporation observations were taken at Valdai (near Leningrad), Kamennaia Step' (Voronezh district), Dubovskaia run-off station (Rostov district), at the site of the Turkmen Canal construction and at agrometeorological stations at Elshanka (Kuibyshev district) and Poltava. At the Valdai station a complex installation for observation of soil evaporation has been operating since 1950. It is a monolith of soil in its natural state with a surface of 5 m², about 2 m deep and weighing about 50 tons. It has a special installation for weighing moisture content with an accuracy of up to 1.1 mm. The main emphasis was placed on the calculation of evaporation by the heat balance method. The conclusion was reached that the heat balance method is the most applicable. Calculation of evaporation by the use of lapse rate data has been worked out at the Central Institute of Weather Forecasting. The conference approved a proposal for a more complete investigation of the nature of processes accompanying evaporation inside the soil and for conducting comparative observations by different methods. *Subject Headings:* **1. Evaporation from soil 2. Evaporation measurement.**—*N.T.Z.*

4.11–31 551.501:551.578.46:551.311.18(26)

TSurikov, V. L. and Pervakov, I. L., **Novyĭ metod opredeleniia tolshchiny l'da i snega na l'du na khodu sudna.** [A new method of determining the thickness of ice, and of snow on the ice, from a moving ship.] *Meteorologiia i Gidrologiia*, No. 7:44–46, **1952.** 2 figs., 2 refs. **DLC**—The authors criticize previous methods of ice and snow thickness measurement and describe a new instrument. A small tube is attached parallel to the end of a rod 60 cm long. A frame is located near the other end of the rod (14×22 cm) with a Plexiglass plate on which a rectangular grid is drawn (size of each square 20×20 mm). The grid can be moved along the rod. The rod is placed vertically outside the ship and the observer marks how many squares of the grid are covered by ice. Thickness of ice and snow is determined by a method of similar triangles. *Subject Headings:* **1. Ice thickness measurement 2. Snow surveys.**—*N.T.Z.*

4.11–32 551.501.1:551.508(02)

Gutmann, Josef, **Beobachtungs- und Messmethoden des Wetterdienstes.** [Methods of observations and measurement used by the weather service.] *Austria. Zentralanstalt für Meteorologie und Geodynamik, Publikation*, No. 158, **1948.** 143 p. 94 figs., tables, refs. **DWB**—A new and excellent edition of the instructions which have been used by the Austrian Meteorological Service since its foundation in 1848. The evaluation of the network and instructions which have gone through many editions (by KRIEL, JELINEK, HANN and others), is outlined by the director, H. VON FICKER in the introduction. A clever device is used to call attention on the one hand to paragraphs of interest to new observers (right margin stripes), to observers at first order stations (left margin stripes) and to very important passages (double stripes). The many illustrations, references, index, etc. make this a real handbook of meteorological instruments as well as observations (*see item* 2C–164, March 1952, *MAB*). The elements treated in great detail are: pressure, temperature, soil temperature, humidity, cloudiness, sunshine, wind duration and force, precipitation, snow cover, thunderstorms, auroras, St. Elmo's fire, optical phenomena, visibility, soil conditions, phenological observations, etc., including calibration and maintenance of instruments, entries on forms checking and computing averages and other practical aspects. *Subject Headings:* **1. Observers manuals 2. Meteorological instruments 3. Handbooks 4. Austria.**—*M.R.*

4.11–33 551.501.45:519.241.1

Schnoor, Ernst, **Verfahren zur exakten und näherungsweisen Vorausberechnung der optimalen Formelexponenten in der Korrelationsrechnung.** [Experiments in the exact and approximate calculation of the best-fitting power formulas in correlation calculations.] *Meteorologische Rundschau*, 6(3/4):51–53, March/April **1953.** fig., eqs. **MH-BH**—In finding relation between sedimentation and salinity, temperature, etc. in Emden Harbor an expression of the form $y=a+bx+cx^p$ was used. The most rapid way of calculating $p$ is to use the logarithmic form. A method of calculation with one independent variable is described and the

extension to several variables indicated. *Subject Headings:* **1. Computation of correlatio coefficients 2. Oceanography.**—*C.E.P.B.*

4.11–34 551.501.7:551.52

Kliucharev, S. S., **O vychislenii advektsii temperatury v tseliakh aerologicheskogo analiz** [The measurement of temperature advection for aerological analysis.] *Meteorologiia Gidrologiia*, No. 3:20–28, Nov. **1950.** 2 figs., 2 tables, 4 refs., 7 eqs. **DLC**—Temperatu advection in the lower layers of the atmosphere is measured by the following equation: $\left(\frac{\partial T}{\partial t}\right.$ $=\left(\frac{\partial T}{\partial x} V_x+\frac{\partial T}{\partial y} V_y\right)$, where $\frac{\partial T}{\partial x}$ and $\frac{\partial T}{\partial y}$ are temperature gradients and $V_x$ and $V_y$ are wind ve locities. An example of calculated advective temperature changes at the nearby points presented. For calculating temperature advection at elevation exceeding 1000 m the followin formula is derived: $\left(\frac{\partial T}{\partial t}\right)_a=\frac{0.36}{h_n-h_1}\sum_{i=1}^{n-1} v_i v_{i+1} \sin \Delta x$, where $\left(\frac{\partial T}{\partial t}\right)_a$ is in degrees/3 hours; 0.3 —coefficient for latitude 56°N.; $h_n-h$—thickness of the atmospheric layer in kilometers; and $v_{i+1}$—wind velocity in m/sec at elevation $h_i$ and $h_{i+1}$; $\Delta x$ angle between vectors $\bar{v}_x$ and $\bar{v}$ An example of the application of this method to the analysis of a cold air intrusion is give The disturbances of advection with elevation during the passage of a cold front and the di tribution of temperature with elevation are calculated. *Subject Headings:* **1. Advectiv temperature change measurements 2. Aerological studies 3. U.S.S.R.**—*I.L.D.*

4.11–35 551.501.7:551.521

Pressly, E. C. (*Nav. Res. Lab., Wash., D. C.*), **Air mass between an observer and outc space.** *Physical Review*, 89(3):654–655, Feb. 1, **1953.** 2 figs., table, 4 refs. **DWB**— formula is offered for calculating the mass of air contained in a column of unit cross sectio between outer space and a point located at any given altitude, at any given zenithal angl A curve representing this formula is drawn up. Values of mass of air are tabulated for zeni angles 0–90° and for points located at altitudes from 0 to 150 km. *Subject Heading:* **1. A mass geometry.**—*G.T.*

4.11–36 551.501.8:52(0

Lovell, Bernard and Clegg, J. A., **Radio astronomy.** London, Chapman and Hall, 195 238 p. 120 figs., 7 tables, refs. Frontiers of Science Series. **GB-MO**—After introductor chapters on astronomy and the transmission and reception of electromagnetic waves, th popular book takes up the study of meteors by radio echo, its results and significance, rad waves from the sun, sunspots and solar flares, radio waves from the galaxy, twinkling of rad stars, the aurora, radio investigation of the moon and the planets, and afterglow. *Subje Headings:* **1. Radio astronomy 2. Textbooks.**—*C.E.P.B.*

4.11–37 551.501.83:551.547.1:526.9:621.396

Grant, A. St.-C. G. (*Meteorologist, Dept. of Transport, Canada*), **Some meteorologic problems of electronic surveying.** *Royal Meteorological Society, Canadian Branch*, [*Public tions*], 3(3), **1952.** 9 p. fig., 9 refs. **DWB**—The technique of electronic surveying is d scribed. Distances are measured by radar from aircraft with a known elevation and valu obtained are then reduced to map distances. The author briefly discusses the effect of atmo pheric conditions on the determination of aircraft elevation, and on the atmospheric refractio of radio signals. *Subject Headings:* **1. Height computation 2. Radar 3. Refraction electromagnetic waves 4. Aerial surveying.**—*G.T.*

4.11–38 551.501.89:551.510.53

Huntley, H. E., **Radio-astronomy in the tropics.** *Nature*, London, 172(4368):108, Ju **18, 1953.** ref. **DWB**—Account of a radio-astronomy observatory at Achimota, near Accr Gold Coast, started Jan. 1952. Program includes hour-by-hour recording of F-layer di turbances, solar activity and coordinates of radio stars. *Subject Headings:* **1. Ionospher disturbances 2. Radio astronomy.**—*C.E.P.B.*

## OBSERVATIONAL DATA

*See also:* **Air temp., Austria, 1901–1950** (Austria, Hydrographic Bureau), 4.11–244.

4.11–39 551.506(436)(058)

*Austria. Zentralanstalt für Meteorologie und Geodynamik, **Jahrbuch, 1951, Neue Folge, 88. Band.** [Yearbook, 1951, v. 88.] Vienna, **1952.** Each section separately paged. Tables. *Austria. Zentralanstalt für Meteorologie und Geodynamik, Publication*, No. 163. **DWB**—Besides the routine features mentioned in *item* 2.11–20, Nov. 1951, *MAB*, this yearbook contains a report on the examination of barometers in the network and annual means of magnetic data in Vienna for 1851–1950 (by M. Toperczer). Three scientific papers included are abstracted separately. *Subject Headings:* **1. Observational data 2. Annual meteorological reports 3. Austria. I. Toperczer, M.**—*A.A.*

4.11–40 551.506(431/5)(058)

*Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, **Deutsches Meteorologisches Jahrbuch, 1950, Teil 2, Monats- und Jahresergebnisse.** [German Meteorological Yearbook, 1950, Pt. 2, Monthly and yearly results.] Pub. **1952.** 133 p. mostly tables. **DWB**—Standard monthly and annual climatological data for 165 stations published with due regard to the decisions of the conference of directors in Warsaw, Salzburg and Washington (1947). Fifty-eight stations made temperature, vapor pressure, relative humidity and cloudiness observations four times daily, the rest three times daily. Forty-two stations do not observe humidity. Special features of this yearbook: number of ice, frost and snow cover days; first and latest dates with frost and snow cover; pentade means or totals for pressure, temperature, sunshine duration and precipitation; deviation of temperature and precipitation from normal; minimum temperatures at 5 cm height; catalog of weather situations and air masses; summary for sunshine duration, containing also mean hourly values; ground temperatures (mostly 4 times daily), and cloudiness without Ci. *Subject Headings:* **1. Observational data 2. Annual meteorological reports 3. East Germany.**—*A.A.*

4.11–41 551.506.1:519.2(058)(45)

*Milan. Seminario Arcivescovile. Osservatorio di Fisica Terrestre, **Annuario.** [Annual.] First issue received, v. 1, **1939** (pub. 1940); last issue received, v. 8, **1951** (pub. 1952). 34 p. 25 tables, 11 figs., plates, refs. **DWB**—In the 1951 issue besides the usual tables of daily and monthly pressure, temperature, vapor pressure, relative humidity, precipitation, wind, cloudiness, sunshine and hydrometeors and an annual summary for the monthly means for each element for the period 1934–51 are given, and an analysis made (by D. E. Orsenigo) of the monthly course of each element (with graphs or histograms comparing 1951 values with 1934–51 averages). Precipitation, winds, sunshine and cloudiness are given an especially thorough analysis and a brief article is included on statistical analysis of meteorological variables (with illustrations). Finally, there is an article on radiogeological research in North America. *Subject Headings:* **1. Annual meteorological reports 2. Observational data 3. Statistical analysis. I. Orsenigo, D. E.**—*M.R.*

4.11–42 551.506.1:551.515(73)

*U. S. Weather Bureau, **United States Meteorological Yearbook, 1943/1949.** Wash., D. C., U. S. Govt. Print. Office, **1952.** 137 p. mostly tables. **DWB**—Foreword: Tables similar to those included in this yearbook were published in the U. S. Meteorological Yearbooks for the years 1935 through 1942, and in the Annual Reports of the Chief of the Weather Bureau for preceding years. Beginning in 1950, these tables are published in the annual issue of Climatological Data, National Summary. This is the final issue of U. S. Meteorological Yearbook. This "Yearbook" combines but does not summarize data for 7 separate years. The tables include detailed data on separate tornadoes by states, hailstorm losses by months and by states, windstorm losses (other than tornadoes), sunshine hours and percentage, excessive rainfalls for periods from 5 to 180 minutes, total evaporation and wind movement by months for each evaporation station. Very brief explanations accompany the extensive

tables. *Subject Headings:* **1. Annual meteorological reports 2. Storm damage 3. Unite States.**—*M.R.*

4.11–43 551.506.1(8

*Venezuela. Fuerza Aerea. Servicio de Meteorología y Communicaciones, **Boleti Bimestral, ano I, num. 1, enero/febrero, 1950.** [Bimonthly bulletin, year I, no. 1, Jan./Fe 1950.] Maracay, Jan. 1950–. Last number received, year 2, No. 10, July/Aug. **1951.** most tables. **DWB**—Daily (sometimes 4 times daily) and monthly records of pressure, ten perature, rain, humidity, wind, evaporation and sunshine are tabulated for 13 synoptic and climatological stations of the Ministry of Defense of Venezuela. The presentation is of hig calibre and the format modern. Some changes have been made during the two years publication. Frequencies of wind direction and velocity, low cloud and visibility appear some of the issues. *Subject Headings:* **1. Monthly climatic reports 2. Observational da 3. Venezuela.**—*M.R.*

4.11–44 551.506.2(49

*Vandenplas, A., **Le temps en Belgique pendant l'année 1951 et ses rapports avec production agricole.** [Weather in Belgium during 1951 and its relation to agriculture.] *Ci et Terre*, 68(11/12):235–252, Nov./Dec. **1952.** 9 figs., 5 tables. Also: *Belgium, Instit Royal Météorologique, Publications, Ser. B*, No. 2, **1952. DWB**—The winds in Belgium in th harvest year (Dec. 1950–Nov. 1951) were analyzed by seasons for the vegetative period an for the year (16 directions) and their frequency in 1951 compared with normal. A prevalenc of S, SSW and SW winds compared with normal, and a deficiency of WSW–NNW winds evident. The year was wet and stormy. The last two months of 1951 were very mild. Sun shine and cloudiness normal and so were the relative humidity and fog frequency. All seasor except autumn had an excess of precipitation in almost every district of Belgium. As a resu of the continuous rains, crops were slow in spring and summer, but the mild fall weath resulted in good root crops and cereal harvests. Many isopleth charts show seasonal an annual conditions in Belgium for the year. *Subject Headings:* **1. Agricultural climatolog 2. Phenology 3. Belgium.**—*M.R.*

4.11–45 551.506.3:551.573(4

*Antonik, Bertold and Branicki, O., **Ergebnisse 50jähriger Beobachtungen mit de Wild'schen Evaprimeter in Potsdam.** [Results of 50 years' observations with the Wi evaporimeter in Potsdam.] *Germany. Deutscher Wetterdienst in der US-Zone, Bericht* No. 42:73–77, **1952.** 4 figs., 3 tables, 4 refs. **DWB**—Totals of evaporation for each mont 1901–50 are tabulated and discussed and compared to relative humidity. *Subject Heading* **1. Evaporation data 2. Potsdam, Germany.**—*C.E.P.B.*

4.11–46 551.506.3(5

*Tateno, Japan. Aerological Observatory, **Thirty years' climatic data, Tateno, Japa 1921–1950.** [1952]. 96 p. 81 tables, graphs and figs. In Japanese; title-page, table contents and legends in Japanese and English. **DWB**—Photographs show surroundings observatory to the North and East. Comparisons are made graphically between month course of various temperature, wind and precipitation elements for Tateno, Tokyo, Mit and three other stations with more than 40 years of record. Twenty tables give averag monthly and daily temperatures, and averages on clear and cloudy days, five day averag (mean, maximum and minimum), frequency of daily temperature ranges, hourly averag (whole, clear and cloudy days), duration of warm and cold days, soil temperature, etc. Eigh humidity tables, 11 wind, 14 precipitation, 1 evaporation, 5 pressure, 9 cloud and sunshin and 12 miscellaneous phenomena tables show equal variety with the temperature table There has rarely been a more imaginative and analytical summary published. Wind ros and numerous graphical devices are used to illustrate variations, and many contingency tabl are included. *Subject Headings:* **1. Climate of Tateno, Japan 2. Climatic data 3. Long perio records 4. Tateno Observatory, Japan.**—*M.R.*

4.11–47 551.506.5(90)

Robin, Gordon de Q., **An international expedition to Antarctica.** *Geographical Journal*, 119(2):155–168, June **1953.** 10 photos, 2 maps, table. Discussion p. 166–168. **DWB**—Account of the Norwegian-British-Swedish expedition of 1949–1952 with some preliminary meteorological data for Maudheim (71°S., 11°W.) and of flights and sledge journeys, ice depth and temperatures. *Subject Headings:* **1. Antarctic expeditions 2. Maudheim Expedition, 1949–1952.**—*C.E.P.B.*

4.11–48 551.506.8(43)

*Schnelle, Fritz and Wittenstein, Franz (*Bad Kissingen*), **Beiträge zur Phänologie Deutschlands. II. Tabellen phänologischer Einzelwerte von etwa 500 Stationen der Jahre 1936–1944.** [Contributions to the phenology of Germany. II. Tables of phenological single values for about 500 stations for 1936–1944.] *Germany. Deutscher Wetterdienst in der U. S. Zone, Berichte*, No. 41, **1952.** 120 p. **DWB**—The contents of this publication are: the origin of the German phenological service under the direction of K. Knoch in 1936; the operation of the service, list of plants, both wild and cultivated and of the phases observed until 1944; a description and explanation of the phenological tables; the phenological tables for 1936–1944 and a list of the phenological stations and a map showing their locations. *Subject Headings:* **1. Phenology 2. Phenological data 3. Germany.**—*I.L.D.*

4.11–49 551.506.8:631

Thornthwaite, Charles W., **Climate in relation to planting and irrigation of vegetable crops.** Seabrook, N. J., Johns Hopkins University, Laboratory of Climatology, April, **1952.** 12 p. 5 figs., foot-refs. Prepared for presentation at XVIIIth International [Geographical] Congress, Wash., D. C., Aug. 8–15, 1952. Mimeo.—The fast growing English garden pea is suggested as a measure for plant development. Assuming that plant development is proportional to potential evapotranspiration, a convenient slide rule is constructed, converting the civil into a climatic calendar. Knowing the necessary "growth units" for each plant, the planting dates can be calculated in order to plan desired harvest dates. *Subject Headings:* **1. Phenology 2. Agronomy 3. Seabrook, N. J.**—*A.A.*

4.11–50 551.506.8:631

Thornthwaite, C. W., **Klima-Kalender und Pflanzenwachstum.** [Climatic calendar and plant growth.] *Umschau*, 53(14):422–424, July 15, **1953.** 5 figs., 8 refs. **DWB**—The pea is a convenient "yardstick" for recording effect of weather on daily plant growth. At Seabrook, N. J., the effective elements are temperature and water supply. The water-need of a plant is measured by evapotranspirometer. The unit of growth is defined as the interval between two nodes of the pea plant and equals 0.1 mm evapotranspiration. Number of units in conjunction with rainfall is a guide to artificial watering. A "harvest sliderule" is described which shows the date of sowing of any crop at New Jersey for harvesting on a given date. Essentially translated from above article 4.11–49. *Subject Headings:* **1. Agronomy 2. Phenology 3. Seabrook, N. J.**—*C.E.P.B.*

## INSTRUMENT CARRIERS

*See also:* **Day and night measurement of total cosmic ray intensity at balloon altitudes** (Dawton, Elliot), **4.11–152.**

4.11–51 551.507.3:598.65:551.508.821

Kobelev, K. A., **Golubezond.** [A "pigeon"-sonde.] *Meteorologiia i Gidrologiia*, No. 3:26–27, **1952.** **DLC**—For more frequent sounding of the lower atmosphere at Riga Observatory the author designed a special light-weight meteorograph. The instrument (weight is about 42 gr) is located in a special box on the back of a pigeon which is raised by pilot balloon. When the Bickford fuse holding the box bottom burns out it frees the pigeon with the meteorograph. Usually the pigeon comes back from a height of 3 km in 20–30 min. and from a height

of 4–5 km in 1.5–2 or more hours. The accuracy of the author's instrument was ±1.7°C. *Subject Headings:* **1. Pigeon meteorograph 2. Riga Observatory, Latvia.**—*N.T.Z.*

4.11–52 551.507.362

Singer, S. F., **Synoptic rocket observations of the upper atmosphere.** *Nature*, London, 171(4364):1108–1109, June 20, **1953.** 15 refs. **DWB**—Outlines a proposal for launching small rockets from aircraft to obtain great heights cheaply. Possibilities include synoptic ozone and UV measurements, high altitude cloud surveys, and cosmic radiation observations. *Subject Heading:* **1. Rockets.**—*C.E.P.B.*

## INSTRUMENTS

*See also:* **Critical rime studies** (Grunow), 4.11–8; **Observation and measurement methods** (Gutmann), 4.11–32; **"Pigeon-sonde"** (Kobelev), 4.11–51; **Stormy weather research group** (McGill Univ.), 4.11–204; **Theoretical investigation of cloud and precip. physics and dynamics** (McGill Univ.), 4.11–205; **Icing on code type radiosonde** (Ishii), 4.11–209.

4.11–53 551.508(02)

Behar, Manoel Felix de Mayo (*ed.*), **The handbook of measurement and control.** Pittsburgh, Pa., Instruments Pub. Co., **1951.** 291 p. illus., refs. **DWB**—A systematic review, outline of principal features and classification of instrumentation in thermometry, pyrometry, flow-rate measurement, liquid and gas meters, pressure and vacuum, speed measurement, chemical analysis, determination of physical properties and testing, electrical measurement, dimensional gaging, control valves, special research instrumentation, aviation and nucleonics. This work of exceptional value is written by 14 specialists outstanding in each field with special emphasis on industrial applications. Articles of special value for meteorologists are abstracted separately. *Subject Headings:* **1. Instruments 2. Instrument classification 3. Handbooks.**—*A.A.*

4.11–54 551.508.7:551.521.3:551.571

Toropova, T. P., **Opredelenie kolichestva vodianogo para, soderzhashchegosia v atmosfere spektroskopicheskim metodom.** [Determination of the quantity of water vapor in the atmosphere by a spectroscopic method.] *Akademiia Nauk, SSSR, Doklady*, Moscow, 86(1):59–61, Sept. 1, **1952.** 3 figs., 3 refs. **DLC**—A few measurements of the intensity of solar radiation were made in infrared with the maximum absorption at $\lambda = 0.94\mu$ in order to determine the precipitable water vapor content of the atmosphere. The relative values were calibrated by aerological data. *Subject Headings:* **1. Precipitable water vapor 2. Water vapor absorption 3. Spectroscopic water vapor measurement.**—*A.A.*

4.11–55 551.508.71

Deriagin, B. V. and Mel'nikova, M. K., **Membrannyĭ gigrometr i primenenie ego dlia opredeleniia otnositel'noĭ vlazhnosti vozdukha.** [A membrane hygrometer and its application to determination of relative humidity.] *Meteorologiia i Gidrologiia*, No. 5:54–58, **1952.** 4 figs., 5 refs., 11 eqs. **DLC**—Description of a new instrument constructed on the principle of water vapor diffusion through a porous diaphram. Previous investigations reviewed. Critical remarks on the work of W. Findeisen, A. Specier-Gregory, and S. Rourke included. The testing of the new hygrometer showed great accuracy and can be recommended for humidity observations. *Subject Heading:* **1. Hygrometers.**—*N.T.Z.*

4.11–56 551.508.71:551.584

Goillot, C., **Un nouvel hygromètre specialement conçu pour l'étude des microclimats au laboratoire ou a l'extérieur sous abri.** [A new hygrometer specially designed for the study of microclimates in the laboratory or outside under shelter.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, 4(2):207–212, **1952.** 6 figs., French, German, English summaries p. 207. **DWB**—The hygrometer consists of 2 thin strips, white cellulose paper and metal film, stuck together and twisted into a spiral. Coiling and uncoiling activates an index. *Subject Heading:* **1. Hygrometers.**—*C.E.P.B.*

4.11–57 551.508.71

Gold, Ernest, **Unusual wet-bulb readings.** *Meteorological Magazine*, London, 82(968):54, eb. **1953. MH-BH**—Describes errors in wet-bulb due to: 1) water freezing on muslin (dry lb 30°F, wet bulb 31½); 2) melting of ice on wet bulb. *Subject Heading:* **1. Psychrometers.**—*E.P.B.*

4.11–58 551.508.71

Grunow, Johannes and Hommel, Karlheinz, **Temperatur- und Feuchtemessung in der ütte mit dem doppelt aspirierten Psychrometer.** [Temperature and humidity measure- ents in the screen with a double aspirated psychrometer.] *Annalen der Meteorologie*, 3/5):77–82, **1952.** 2 figs., 4 tables, 2 refs. **MH-BH**—Numerous comparative observations Hohenpeissenberg with a psychrometer with both bulbs ventilated and the usual one (only et bulb ventilated) in screens are discussed. Differences small except when screens were in nshine. Diurnal variation, on such days, of dry bulb temperature and relative humidity e discussed. Doubly ventilated psychrometers are desirable in all screens in sheltered nny places. *Subject Headings:* **1. Aspiration psychrometers 2. Hohenpeissenberg, Ger- any.**—*C.E.P.B.*

4.11–59 551.508.71

Hofmann, G., **Strahlungsfehler bei Haarhygrometern.** [Radiation errors in hair hy- ometers.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 42:66–67, 1952. refs., 9 eqs. **DWB**—Irradiated hairs reach a higher temperature than surrounding air. difference of 1°C causes a humidity error of 7%. *Subject Heading:* **1. Hair hygrometers.**—*E.P.B.*

4.11–60 551.508.71

Kato, Takeo, **The salt attaching on the cloth of wet-bulb.** *Oceanography and Meteor- ogy*, Nagasaki, Japan, 5(1/2):39–41, June **1951.** 2 figs., 3 tables. In Japanese. **DWB**— mounts of Cl and Ca deposited during periods of varying length in 1949–1951, and 10-day erages of these amounts are tabulated. The data were obtained at several meteorological ations in Japan. A graph of the annual variation in Cl deposits and a correlogram showing e influence of Cl on instrumental readings (as found in experimental measurements) are esented. *Subject Heading:* **1. Psychrometers.**—*G.T.*

4.11–61 551.508.71

Little, Arthur D., Inc., **Development and manufacture of electric hygrometer elements r meteorological use.** Contract DA-36-039-sc-163, Final Report, March 31, **1951.** 26 p. figs., 4 refs. **DWB**—Report on the manufacturing and testing of carbon film electric ements produced by spraying an aqueous dispersion of carbon, binder, humectant and dis- ersing agent upon a metal-edged polystyrene blank. Procedures and equipment are de- ribed in detail and illustrated by photographs and diagrams. An outstanding achievement aimed is the elimination by purification of the drop in resistance at humidities between 85 nd 95% which was due to electrolytic impurities introduced with raw materials. Cost of e product is $1.95 per element. *Subject Headings:* **1. Electric hygrometers. I. Contract A-36-039-sc-163.**—*G.T.*

4.11–62 551.508.71

Palmer, H. P., **An improved automatic frost-point hygrometer.** *Great Britain, Meteoro- gical Research Committee, M.R.P.* 774, Nov. 14, **1952.** 6 p. 4 figs. Mimeo. **DWB**—An nproved and simplified ex-Elliott automatic hygrometer with a germanium thimble, for use aircraft, is described with diagrams of construction. *Subject Heading:* **1. Frost point hy- ometers.**—*C.E.P.B.*

4.11–63 551.508.71:551.508.822

Schulze, Werner, **Zur Trägheit und Feuchtemessung des gewalzten Haares nach Franken- erger.** [On the lag and humidity measurement of Frankeberger's rolled hair.] *Annalen der leteorologie*, 5(1–2):35–45, **1952.** 9 figs., table, 5 refs. English summary p. 45. **DWB**—

Since Feb. 1951 the "Velox hair" has been used in the daily radiosonde ascents. The theory calculation of lag is discussed and the lag coefficient of this hair at different values of absolu humidity or dew point set out and compared with the old type of hairs, British goldbeater skin and the bimetallic element. At 50% RH lag is about 10 sec down to −30°C and belo 60 sec down to −55°C. A method of correction is given, using up and down traces, and son results of the greater accuracy discussed. *Subject Headings:* **1. Hygrometers 2. Radioson recorders.**—*C.E.P.B.*

4.11–64 551.508.71:551.5

Unger, K., **Thermoelementpsychrometer für mikroklimatische Messungen.** [Therm element psychrometer for microclimatic measurements.] *Angewandte Meteorologie*, 1(9):28 283, Feb. **1953.** 3 figs., 8 refs. **DWB**—The instrument consists of constantan-copper jun tions of 0.02 mm wire connected to a recording galvanometer. Special provisions regula supply of moisture to the wet element. Wiring diagram, photo and specimen record give *Subject Headings:* **1. Psychrometers 2. Micrometeorological instruments.**—*C.E.P.B.*

4.11–65 551.501.9:551.508.

Wexler, Arnold, **Recirculating apparatus for testing hygrometers.** *U. S. National Bure of Standards, Journal of Research*, 45(5):357–362, Nov. **1950.** 8 figs., 4 tables. **DLC**—T apparatus described was designed for the Bureau of Ships, Dept. of the Navy, for calibrati and research purposes. It operates through creating saturation at a given temperature a then raising the air temperature so as to give any desired relative humidity. The apparat can be used in temperatures down to −40°C. Average deviation between gravimetrical measured and apparatus relative humidity is 1.2%. Technical details are given and show on photographs and diagrams. *Subject Headings:* **1. Hygrometers 2. Hygrometer ca bration.**—*G.T.*

4.11–66 551.508.

Brown, Paul L. and Hallsted, A. L., **Comparison of evaporation data from standa Weather Bureau and Plant Industry type evaporation pans.** *Agronomy Journal*, Wash., D. C 44(2):100–101, Feb. **1952.** table. Abstracted from reprint. **DWB**—Fourteen years contemporary observations showed a close relationship. The U. S. Weather Bureau pa 4 ft in diameter and exposed, while the Bureau of Plant Industry pan is 6 ft in diameter and set in the soil. The reduction equations are

$$Y \text{ (Weather B.P.)} = 1.46X + .031 \text{ (in.)}$$
$$X \text{ (Plant I.P.)} = 0.667Y + .194 \text{ (in.)}$$

*Subject Heading:* **1. Evaporation pans.**—*A.A.*

4.11–67 551.508.

Garnier, Benjamin John (*University College, Ibadan, Nigeria*), **A simple apparatus f measuring potential evapotranspiration.** *Nature*, London, 170(4320):286–287, Aug. 16, 195 **DWB**—Description of apparatus, installed by the author in Seabrook, N. J. A known amou of water is applied to a tank covered by turf. Measuring the percolated water and knowi the precipitation amount, the potential evapotranspiration can be easily computed. *Subj Headings:* **1. Evapotranspirometers 2. Potential evapotranspiration 3. Seabrook, N. J.**—*A.*

4.11–68 551.508.72:551.579

Natermann, Ernst, **Lysimeter und Wildsche Waage. (Ein Beitrag zur Auswertung d Eberswalde Verdunstungsversuche.)** [Lysimeter and Wild balance. (A contribution to t evaluation of the Eberswald evaporation investigation.)] *Wasserwirtschaft, Sonderhe* p. 10–14, **1952.** 5 figs., 3 refs. **GB-MO**—Lysimeter readings have only very local applicati and the relation between monthly evaporation given by lysimeter ($V_L$) and by Wild balan ($V_W$) was examined. For meadows with ground water $V_L/V_W$ varies from 0.43 (Dec.) to 1.8 (June), for meadows without ground water from 0.23 to 0.90. *Subject Headings:* **1. Lysimet 2. Evaporimeters.**—*C.E.P.B.*

# SYNOPTIC ANALYSIS AND FORECASTING

*See also:* **Cold pools: statistical, synoptic study** (Sumner), 4.11–134.

4.11–69 551.509

Ludlam, Frank Henry, **Recent advances in science. Meteorology. Weather forecasting.** *ience Progress*, 41(161):83–93, Jan. **1953.** 13 refs. **DWB**—Summary of present-day ficial forecasting practice, assembly of data and recent advances in analysis, subjectivity of eparation of forecasts and staffing difficulties, and, finally, the principles and practice of recasting research from L. F. RICHARDSON to date . . . "problems can be attacked only the continued observational and theoretical study of atmospheric motions." *Subject eadings:* **1. Weather forecasting 2. Progress in meteorology.**—*C.E.P.B.*

4.11–70 551.509.3

Yamashita, H., **A method of weather forecasting by meteorological change near tropo- use.** *Journal of Meteorological Research*, Tokyo, 4(5):179–185, Aug. **1952.** 4 figs., 2 bles. 8 refs. In Japanese, English summary p. (13–14). **MH-BH**—The author in- stigates variations in height and temperature of the tropopause. When the height is creasing and the temperature decreasing at the tropopause, the advection of tropical air is pected. This is a good tool for weather analysis concerning the development and movement low pressure, and also for locating the tendency of a "Bai-u" front to change to warm frontal tivity in the late "Bai-u" season. *Subject Headings:* **1. Weather forecasting 2. Tropopause ight variations 3. Bai-u.**—*Author's abstract.*

4.11–71 551.509.31

Coles, V. R., **Short-range weather forecasting.** *Meteorological Magazine*, London, (968):47–50, Feb. **1953. MH-BH**—Discussion of Compendium papers by G. E. DUNN d R. C. BUNDGAARD (*see items* 3.6–5, 3.6–3, June 1952, *MAB*). Several speakers referred forecast procedure and research in the Central Forecasting Office, Dunstable. *Subject eading:* **1. Short range forecasting.**—*C.E.P.B.*

4.11–72 551.509.31

§Trans World Airlines, Inc., **Weather analyses survey, November 20–26, 1952.** Jan. 23, **53.** unpaged. entirely charts. **DWB**—A series of re-analyzed surface synoptic charts J.S.A.) for 0130, 0730, 1330 and 1930E for the 7-day period from Nov. 20 to 26, 1952, in- usive, are presented along with the frontal analysis made at each of 9 weather stations ut of 20 whose analyses were examined). The development of two intense storms, one oving from the southern Appalachians north and then NW to the Great Lakes and one from exas to the Great Lakes, is beautifully illustrated. However the most striking feature is e alarming variation in analysis of each situation—varying from a single simple front in one alysis, to a complex network of fronts in another. *Subject Headings:* **1. Synoptic series Frontal analysis variations 3. Cyclone development 4. Eastern United States.**—*M.R.*

4.11–73 551.509.31

*Wadsworth, George P. (*M.I.T.*), **Accuracy of short-range forecasting.** Massachusetts stitute of Technology, Division of Industrial Cooperation, Contract AF19(122)-447, Report o. 2, Aug. 1, **1951.** unpaged. tables, graphs. **DWB**—A statistical study on the accuracy short range forecasts as a function of the season, the geographical location and the factor experience of the forecaster. Forecasts were made for eight places in the U. S. under con- olled conditions by three meteorologists with experience from five to eleven years, working dependently. Error distributions for pressure and temperature are presented in tables and aphs. Good material for more detailed study. *Subject Headings:* **1. Forecast accuracy Short range forecasting 3. United States. I. Massachusetts Institute of Technology. ivision of Industrial Cooperation II. Contract AF19(122)-447.**—*A.A.*

4.11–74 551.509.311:551.515.

Rampey, Ernest M., **Forecasting the speed of movement of selected cyclones along upp air steering channels.** *Journal of Meteorology*, 10(3):191–196, June **1953.** 8 figs., 3 tabl 4 refs. **MH-BH**—Rules are set out for quantitative 24 and 30 hr forecasting of speed a direction of movement of low pressure systems over U.S.A. by temperature advection. T types are distinguished: 1) with closed circulation to 850 mb, steering level 700 mb, 2) clos to 700 mb (but not above), steering level 500 mb. Average error in test forecasts 120–170 r *Subject Heading:* **1. Cyclone forecasting.**—*C.E.P.B.*

4.11–75 551.509.3

de Lisle, J. F., **Recent advances in science. Meteorology. Numerical weather fo casting.** *Science Progress*, 163:454–464, July **1953.** 16 refs., 8 eqs. **DWB**—The proble of formulating equations to describe the motion of the atmosphere are set out. Pressu density and 3 cartesian coordinates are included in 5 equations but the vertical velocity m be computed indirectly. A series of atmospheric models are described leading to successi approximations to the real atmosphere. It is concluded that general surface weather foreca will become practicable but local topographic effects must be dealt with by traditional metho *Subject Headings:* **1. Numerical forecasting 2. Progress in meteorology.** –*C.E.P.B.*

4.11–76 551.509.312:551.541:551.558

Scorer, R. S., **Forecasting waves.** *Gliding*, London, 4(1):32–33, Spring **1953.** grap ref. **DWB**—A simple method of wave forecasting is suggested on the basis of a tephigra prepared at least up to 400 mb by using estimated wind and temperature profiles of the current. *Subject Headings:* **1. Lee wave forecasting 2. Tephigrams 3. Nomograms.**—*G.*

4.11–77 551.509.3

Sherman, Leon, **A numerical forecasting investigation. Part I: Theory.** Flori State Univ., Dept. of Meteorology, Technical Report, Contract NONR-158(00), Jan. **1952.** 19 p. refs., 20 eqs. **DWB**—This paper considers the problem of a single stage num ical forecast of the wind field. The particular forecast method used is based upon the so vorticity equation which provides a means of computing the vorticity tendency and upon analogous equation which provides a means of computing the horizontal divergence tenden . . . Techniques for the estimate of the magnitudes of each of various sources of errors ha been set up and work is in progress to accomplish these estimates. *Subject Headings:* **1. C jective forecasting 2. Numerical forecasting 3. Wind forecasting. I. Florida State Un Dept. of Meteorology II. Contract NONR-158(00).**—*Author's abstract.*

4.11–78 551.509.312:551.51

Sherman, Leon and Riehl, Herbert, **On the propagation of isolines.** *Journal of Meteorolo* 10(3):231–232, June, **1953.** 2 figs., 2 refs., 5 eqs. **MH-BH**—Referring to *item* 3E–2 May 1952, *MAB*, SHERMAN criticizes assumption that wind direction is the same as direct of propagation of lines of constant wind speed. RIEHL replies. *Subject Headings:* **1. Object forecasting 2. Jet stream forecasting.**—*C.E.P.B.*

4.11–79 551.509.312:551.509.3

Johannessen, Karl P. and Cressman, George P. (*Hq. Air Weather Ser., Wash., D. C* **Verification of an equation for trough and ridge motion.** *American Meteorological Soci Bulletin*, 33(7):267–270, Sept. **1952.** 5 tables, ref. **MH-BH**—PETTERSSEN's equation the speed of troughs or ridge lines is tested out on 157 troughs and ridges selected from 5 mb charts from the periods Oct. 1, 1950 to March 31, 1951, May 1951 and Dec. 17, 1951 Jan. 4, 1952, persisting for a minimum of 24 hours with approximately north-south a trough and ridgelines were defined as lines of maximum streamline curvature. The paramet measured were wave length, latitude, core speed, half width of jet and 24 hour displaceme It was found that 24-hour computed speed gave better results than extrapolation of p motion, that for ridges but not for troughs computed speeds over the Rocky Mountain reg were subject to greater systematic errors than those over flatter country. Systematic er

at the 500 mb level is less than at 300 and 700 mb levels and it was "found to be small for troughs (<1 long° per day) but considerable for ridges (+3 to +5 long° per day)," the error scatter was the same for trough and ridges. Results were found to improve when data resembling the model for which formula was derived, were used. *Subject Headings:* **1. Kinematic analyses 2. Upper air analysis I. Petterssen, S.**—*I.L.D.*

4.11–80 551.509.317

Clapp, Philip F. (*U. S. Weather Bureau*), **Application of barotropic tendency equation to medium range forecasting.** *Tellus*, 5(1):80–94, Feb. **1953.** 8 figs., table, refs. p. 93–94, 9 eqs. **MH-BH**—The simple barotropic vorticity equation has been used to compute height tendencies on a few 5-day mean 500 mb charts. The results are approximately as good as similar computations made on synoptic flow patterns despite the fact that the time interval between observed charts is 5 times as great. The order of magnitude of the computed tendencies may be considerably improved provided some account is taken of the effects of transformation of potential into kinetic energy, surface friction and non-adiabatic heating. A first approximation to these factors may be obtained by setting them equal to their climatological or normal values. A simple method for integrating the barotropic equation is derived upon assuming that the anomalies of the large-scale flow patterns may be approximated by a relatively small number of Rankine vortices. *Subject Headings:* **1. Extended forecasting 2. Barotropic tendency equation.**—*Author's abstract.*

4.11–81 551.509.59:551.311.18(268)

Armstrong, Terence, **Beobachtungen auf dem nordsibirischen Schiffahrtsweg.** [Observations on the North Siberian sea route.] *Polarforschung*, 3(2):127–129, **1951.** 9 refs. **DWB**—The primary need for use of Siberian sea route is for ice forecasts. These must be based on sufficient data—there are now 69 coast stations but more ship reports are needed. Forecasts of ice conditions several months ahead have been made since 1923, based on sea temperatures, Icelandic low or cycles. More detailed forecasts for 5–10 days are based on movements of ice, and are 75% good but data are often insufficient. *Subject Headings:* **1. Arctic sea ice 2. Ice forecasting.**—*C.E.P.B.*

4.11–82 551.509.65

**FIDO, FIDO burning bright.** *Aeroplane*, London, 83(2157):696–697, 699, Nov. 21, **1952.** 4 figs. **DLC**—A brief but informative account of the history of FIDO (Fog Investigation Dispersal Operation) in connection with the last demonstration (Nov. 11, 1952) which was staged at Blackbushe, Eng. FIDO was conceived in 1921 by Sir Napier Shaw and Prof. Lindemann (Lord Cherwell), but no experiments were undertaken until 1936. In 1942 Churchill ordered development work to be speeded up, and by 1943 several successful landings had been made by FIDO. In all, 2524 landings and 182 take-offs were made during the war, with a consumption of 37 million gallons of fuel. Six airports were equipped for FIDO but after the war only 3 were maintained, and from 1948–1952 only one landing was made by FIDO. During this year's test, 4 airliners took off and landed to test passenger reaction, plane performance, turbulence, visibility, heat and smoke drift. *Subject Headings:* **1. Artificial fog dissipation 2. Aircraft landing aids 3. Fog Investigation Dispersal Operation 4. England.**—*M.R.*

4.11–83 551.509.65

Harrison, Henry T. (*Manager United Air Lines Weather Service*), **Results of 42 tests of Brandau-Kooser method of artificial fog dispersal (B-K Number 2).** United Air Lines, Inc., Sept. 2, **1952.** 9 p. 15 figs., tables, charts, photos. **DWB**—Report on tests "with a secret chemical" conducted during the period Nov. 18, 1950 to Nov. 24, 1951 by Harvey M. Brandau and Eugene K. Kooser of "Weather Control," Medford, under a contract with United Air Lines. The first 31 tests flown at Medford and Arcata airports showed considerable results, while the last 11, at Portland airport, were utter failures and led to the discontinuation of the contract. Detailed evaluations of each test and cumulative data on weather elements and seeding results are presented in tables and charts. Three series of photographs illustrate fog dispersal. The method tested is judged "too uncertain in its present state of development to

justify routine application for airline use." *Subject Headings:* **1. Artificial fog dissipation 2. Cloud seeding. I. United Air Lines, Inc.**—*G.T.*

### ARTIFICIAL PRECIPITATION

4.11–84 551.509.67

Bonacina, L. C. W., **Rain making and its wider implications.** *Weather*, 8(7):216–217, July **1953. MH-BH**—Discussion of the possible repercussions of "rainmaking" on the general distribution of natural rainfall over the globe. *Subject Headings:* **1. Artificial precipitation.**—*C.E.P.B.*

4.11–85 551.509.67

*Boucher, Roland J., **Evaluation of cloud seeding activities in Peru. A. Cerro de Pasco watershed, Sept. 1951–May 1952. B. Gildemeister watershed, Sept. 1951–June 1952.** Cambridge, Mass., Wallace E. Howell Assoc., Inc., Dec. **1952.** 25+20 p. maps, figs., tables. **DWB**—Summaries of generator operation, cloud motions during seeding, precipitation amount within the watershed and in adjacent areas. Rainfall amount in target areas compared with control stations and with normal amounts, as well as river discharges in target area with control catchment areas. Statistical tests show positive effect of seeding in almost all cases, although with insufficient confidence limit. *Subject Headings:* **1. Cloud seeding effectiveness 2. Cerro de Pasco watershed, Peru 3. Chicama-Moche watershed, Peru. I. Howell, Wallace E., Associates, Inc., Cambridge, Mass.**—*A.A.*

4.11–86 551.509.67

Buell, Carleton E. (*Univ. of New Mexico*), **An approach to the evaluation of the results of rainmaking. A progress report.** Paper presented at the Symposium on Cloud Seeding, Institute of Mathematical Statistics, East Lansing, Michigan, Sept. 4, **1952.** 5 p. 7 figs. Mimeo. **DWB**—In order to test the effectiveness of cloud seeding operations in New Mexico in 1951, the days during July and Aug. 1951 during which KRICK seeded were used as one sample and all days during those 2 months as another. A rainfall index was calculated for each day as a percent of the monthly mean rainfall and this index was tested against the mixing ratio at 700 and 500 mb level and the lapse rate in temperature between 700 and 500 mb as controls. A slightly higher adjusted mean rainfall index was found on days seeded than not seeded, but not significantly higher. With more data it is believed that a real evaluation of effects of cloud seeding on rainfall in an area can be made by this method of covariance analysis. *Subject Headings:* **1. Covariance analysis 2. Cloud seeding evaluation 3. Artificial precipitation 4. New Mexico. I. Institute of Mathematical Statistics, East Lansing, Michigan. Symposium on Cloud Seeding, Sept. 4, 1952 II. Krick, Irving P.**—*M.R.*

## STRUCTURE AND PHYSICS OF THE ATMOSPHERE

### STRUCTURE OF THE UPPER ATMOSPHERE

*See also:* **Radio astronomy in tropics** (Huntley), 4.11–38; **Global circulation** (Goldie), 4.11–114; **High altitude diurnal temp. changes due to ozone absorption** (Johnson), 4.11–164; **Geophysical and met. changes, Jan.–April 1949** (Beynon and others), 4.11–174; **Wind variation near tropopause** (Gold), 4.11–192.

4.11–87 551.510.53

Burnight, T. R. (*Naval Res. Lab., Wash., D. C.*), **Physical characteristics of the upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers* No. 11:67–69, 1952. **DWB**—Recent observations by rockets reveal that at 160 km pressures were about $10^{-6}$ mb and temperatures between 80 and 160 km about 250°K. Solar spectrum (69–115 km) reached 2000 Å, so that solar radiation for 200, 2000 and 3000 Å approximates 4500°K (or possibly as low as 3800°K) black body. Measurements of X-radiations (10 Å) and solar radiation more than 1350 Å (near 100 km) and $O_3$ concentration to 70 km have been obtained. *Subject Headings:* **1. Solar spectrum 2. Rocket observations 3. Upper atmosphere physics.**—*M.R.*

4.11–88 551.510.53:551.521.64

Chapman, Sydney (*Oxford Univ.*), **Corpuscular influences upon the upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:70–85, 1952. 24 refs. Discussion. **DWB**—The evidence for the corpuscular theory of magnetic storms and auroras is briefly reviewed. No certain success has attended the efforts made to detect the solar corpuscules during their emission from the sun or their passage to the earth; recent observations of atomic hydrogen lines in the auroral spectrum, which are broadened by Doppler effect give the most direct support yet available to the corpuscular theory. *Subject Headings:* **1. Corpuscular theory 2. Auroral spectra 3. Upper atmosphere research.**—*Author's abstract.*

4.11–89 551.510.53

Kaplan, J., **Discussion of physics of the upper atmosphere.** (In: U. S. School of Aviation Medicine, Randolph Field, Texas, **Physics and medicine of the upper atmosphere.** Albuquerque, **1952.** p. 331–351.) **DLC**—A summary of selected data that were presented at a round table panel discussion of upper atmosphere physics led by Dr. J. Kaplan. The subjects discussed were: the site of production of $N_2O$, the conversion of $CO_2$ to $O_2$ by means of solar light during space flight, effects of clouds and meteoric dust upon static; the magnetic field near the sun and the reasons for the weakness of cosmic rays nearer the sun, the possibility of cosmic rays interfering with air-borne electronic equipment, the effects of the auroras and the so-called magnetic influences observed both concurrent and probably not concurrent with it, around the polar region, and the possibility of obtaining an over-all picture of cosmic rays from pole to pole. *Subject Headings:* **1. Upper atmosphere physics 2. Cosmic radiation 3. Magnetic influences.**—*I.L D*

4.11–90 551.510.5(02,04)

Zavarina, M. V., **Stroenie atmosfery.** [Structure of the atmosphere.] Leningrad, Gidromet. Izdat., **1948.** 54 p. 21 figs., table. **DLC**—A semi-popular but critical discussion of the upper atmosphere and its structure, composition and exploration for observers all over the Soviet Union who wish to understand something about the scientific knowledge which exists today on that phase of meteorology. A historical sketch tells of a work in "Aerology" published in Rome in 1642, and of numerous attempts to fly (from 906 to 1935) or explore the atmosphere by balloon or kite, airplane and radiosonde (first ascent in the world Jan. 30, 1930 at Pavlovsk near Leningrad). More recent methods for sounding the upper atmosphere are described: searchlight beams, cosmic rays, rockets (American V-2 flights are enumerated), ozone absorption of UV-rays, acoustical and radio-propagation techniques, study of meteors, auroras, noctilucent clouds, etc. An up to date model of the atmosphere to 300 km (with all the details) is presented. *Subject Headings:* **1. Atmospheric models 2. Atmospheric structure 3. Upper atmosphere research 4. Textbooks.**—*M.R.*

4.11–91 551.510.52/3(99)

Rubin, Morton J., **Seasonal variations of the Antarctic tropopause.** *Journal of Meteorology*, 10(2):127–134, April **1953.** 3 figs., 6 tables, 18 refs. **MH-BH**—Upper air temperatures at Little America (78°28′S., 164°55′W.) are compared with those at Arctic Bay (73°16′N., 83°21′W.). In winter the tropopause in the Antarctic disappears on many days. Radiative cooling is calculated and found to lead to an increased lapse rate in lower stratosphere, in absence of exchange with lower latitudes. A. Court's explanation that the disappearance of the tropopause in winter is due to this absence of exchange is confirmed by daily synoptic 50. Hemisphere charts. *Subject Headings:* **1. Tropopause 2. Antarctica. I. Court, A.**—*I.E.P.B.*

4.11–92 551.510.53:551.590.25

McNish, A. G. (*Cen. Rad. Prop. Lab. U. S. Nat. Bur. of Standards*), **A study of radio reflections from meteor trails in research on the upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 7:105–106, Dec. **1950. DWB**—Abstract of the paper, presented at the Conference on Ionospheric Research in June 1949.

Data indicate that meteors are not responsible for most of the sporadic E-reflections. *Subj*
*Headings:* **1. Radio wave reflection 2. Meteor trails 3. Sporadic E layer.**—*A.A.*

4.11–93 551.510.53:551.5

Scorer, R. S., **Air motion in the upper atmosphere.** *Nature*, London, 172(4369):138–1
July 25, **1953.** 5 refs. **DWB**—Account of meteorological problems raised at a discussion
physics of upper atmosphere (Physical Society, London, Feb. 6, 1953). Temperature sho
a maximum in ozone layer about 50 km and minimum at 80 km. Both ozone distribution a
ionization in E layer suggest large air motions but it is not yet clear whether these are winds
the usual sense or some form of wave motion. Variations are very great and are attribut
to dominance of diurnal variations and greater size of convection elements than in troposphe
*Subject Headings:* **1. Ozone layer 2. E layer 3. Stratospheric winds.**—*C.E.P.B.*

4.11–94 551.510.534:06 551.510.41

International Union of Geodesy and Geophysics, International Association of Meteorolog
**International symposium on atmospheric ozone.** *International Union of Geodesy and G*
*physics, Internationale Association of Meteorology, Bulletin d'Information*, 2(2):295–322, Ap
**1953. DLC**—Includes short papers: G. M. B. Dobson, Sunlight observations. Meth
adopted to measure ozone in the worldwide network; Sir Charles Normand, The effect of ha
on the observations; Method of wedge calibration; R. H. Kay, The absorption coefficients
ozone at the wavelengths of the Dobson instrument; G. F. Walton, Secondary scattering a
the Umkehr curves; R. M. Goody, The possibilities of infra-red spectroscopy in ozone inves
gations; R. H. Kay, The vertical distribution of ozone by chemical methods; H. V. Dütsc
The basis of the photochemical theory and its application to latitudinal and seasor
variation of ozone; A. W. Brewer, Atmospheric circulation and water vapour. The i
portance of the chemical $O_3$ determinations with height; Walshaw, Laboratory and theoreti
work on the infra-red 9.6$\mu$ ozone band. Discussion of each paper is reported. *Subj*
*Headings:* **1. Ozone layer 2. Ozone conferences.**—*C.E.P.B.*

## IONOSPHERE

4.11–95 551.510.535:537

Appleton, Edward V., **A note on the "sluggishness" of the ionosphere.** *Journal*
*Atmospheric and Terrestrial Physics*, 3(5):282–284, June **1953.** ref., 13 eqs. **MH-BH**—T
physical effect of recombination or attachment of electrons is to delay the response of chan
in electron density to changes in rate of electron production. The effect in ionospheric measu
ments is discussed and the value of $\alpha N$ ($\alpha$=recombination coefficient) are calculated for D,
and F layers. *Subject Heading:* **1. Ionospheric variations.**—*C.E.P.B.*

4.11–96 551.510.535:621.396.8

Banerji, R. B., **Some studies on random fading characteristics.** *Physical Society*
*London, Proceedings, Ser. B*, 66(2):105–114, Feb. 1, **1953.** 4 figs., 13 refs., 32 eqs. **DWB**
The theory of random fading of pulses singly reflected from the ionosphere is examin
Velocity distribution of fading is found to be independent of the power spectrum of the return
wave. This invalidates the accepted explanation of certain observed departures from theo
An alternative explanation is given and discussed. *Subject Heading:* **1. Radio fading.**—*Fr*
*author's abstract.*

4.11–97 551.510.535:551.594

*Bates, David R. (*Univ. College, London*), **Ionization and recombination processes in t**
**upper atmosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Pape*
No. 11:225–234, **1952.** 21 refs., 29 eqs. **DWB**—Summarizes the present knowledge of t
basic mechanism pertinent to further author's hypothesis to the effect that: 1) the photoioni
tion of atomic oxygen gives rise to the F1 layer and 2) that it gives rise to the E layer. Whet
the general structure of the ionosphere can be explained on the above alternatives is the prem
of this paper. *Subject Headings:* **1. Ionosphere 2. Ionization 3. Recombination processes.**
*W.N.*

4.11–98 551.510.535

*Beth, Eric W. (*Air Force Cambridge Research Center*), **Altitude dependence of some upper atmosphere properties.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:255–262, **1952.** 5 figs., 7 refs. **DWB**—Rocket research results of some investigators are reported for equivalent electron density at heights up to 143 km, ion density around 100 km, and for pressure, kinetic temperature and density of the air between 40 and 100 km. The last three quantities are shown in approximate graphs. The investigation of ion density is still in its initial stage. The equivalent electron density was measured during a magnetic storm; between 110 and 139 km the altitude dependence of electron density was unimportant, its average value being about $1.3 \pm 0.2 \times 10^5$ electrons/cm$^3$. Below 95 km the concentration was too small to be detected. Between 95 and 110 km the ionized region was found to have a patchy or "spongy" structure. *Subject Headings:* **1. Ionospheric composition 2. Electron density 3. Ion density 4. Air density 5. Rocket research.**—*Author's abstract.*

4.11–99 551.510.535:551.594.7

Briggs, B. H., **The determination of the collision frequency of electrons in the ionosphere from observations of the reflection coefficient of the abnormal E layer.** *Journal of Atmospheric and Terrestrial Physics*, 1(5/6):345–348, **1951.** 4 figs., table, 7 refs. **DWB**—The reflection and transmission coefficients of the abnormal E layer were measured by observations of echoes. The abnormal E layer may be a horizontally stratified layer of ionization with a total thickness of 5 km. The collision frequency in the height 110–135 km is found from 1.5 to $4.10^4$ sec$^{-1}$. *Subject Headings:* **1. Ionospheric reflection 2. E layer.**—*A.A.*

4.11–100 551.510.535:551.557.2

Briggs, B. H. and Phillips, G. J. (*Cavendish Lab., Cambridge, Eng.*), **The determination of wind velocities in the ionosphere.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:199–203, **1952.** fig., 3 refs. Discussion. **DWB**—Drift velocities of 70 m/sec were measured. The E-W component is westward at night, decreases during the day and becomes eastward during the summer months, and is more regular than the N–S component usually of much smaller magnitude. The observations were made during the past three years at the Cavendish Laboratory, Cambridge, Eng. The receivers were placed 100–200 m apart at three points of a rectangle. Wave length about 150 m. *Subject Headings:* **1. Ionospheric winds 2. Wind movements.**—*W.N.*

4.11–101 551.510.535:551.594.12

Burkard, Otto, Malinger, F. and Schwarz, F. (*Graz Univ., Austria*), **Die F-Ionisation in den Morgenstunden.** [The F-ionization in the morning.] *Geofisica Pura e Applicata*, 23:43–59, **1952.** 10 figs., table, 7 refs. English summary p. 43. **MH-BH**—Discusses the physical meaning of the experimental relationship $f^2 = a \cos \chi + b$; $f$—critical frequency ($\sqrt{f}$—electron density); $\chi$—zenith distance of the sun; $a,b$—constants. Theoretical explanation given by earth's curvature and the assumption that the decay of ions is proportional to their concentration. Observations are analyzed and the latitudinal and seasonal variation of $a$ and $b$ shown. *Subject Headings:* **1. F layer ionization 2. Diurnal ionospheric variations.**—*A.A.*

4.11–102 551.510.535

Chatterjee, B., **Nature and origin of sporadic E regions as observed at different hours (over Calcutta).** *Journal of Atmospheric and Terrestrial Physics*, 3(5):229–238, June **1953.** 5 figs., 19 refs. **MH-BH**—Reflection coefficients of Es echoes show two types of ionization: a cloud or blob type mainly in early morning attributed to ionization by sporadic meteors, and thin layer type mainly at sunrise in E layer, attributed to photo-detachment of electrons from negative ions of O and $O_2$ by sun rays from below the horizon. In afternoon and evening Es ionization was mixed thin layer and ion clouds coming from above. Associated with thunderstorms was the mixed type or the "blanketing" type. *Subject Heading:* **1. Sporadic E layer.**—*C.E.P.B.*

4.11–103 551.510.535:523.74

Lange-Hesse, Günther, **27 tägige Variationen in der D-Schicht-Absorption der Ionosphäre über Singapore und Slough.** [27 day variations in the absorption of the D region of the ionosphere over Singapore and Slough.] *Journal of Atmospheric and Terrestrial Physics*, 3(3):153–162, April **1953.** 7 figs., table, 12 refs., eqs. English summary p. 153. **MH-BH**—The absorption of electromagnetic waves in the D-layer was found to show a 27-day variation throughout the year at Singapore, and in summer only at Slough (England) when sunspots are unequally distributed in heliographic longitude. At Slough in winter large variations were found, unconnected with sunspots or magnetic disturbance. *Subject Headings:* **1. D layer 2. Sunspots.**—*C.E.P.B.*

4.11–104 551.510.535:551.557

Price, R. E., **Travelling disturbances in the ionosphere.** *Nature*, London, 172(4368):115–116, July 18, **1953.** 2 figs., 2 refs. **DWB**—Observations at 3 points at Nedlands, Western Australia, on 5.8 Mc/s recorded motion of disturbances in reflecting layer. Direction of motion 90–180°E of N in summer and 0–60°E of N in winter with rapid change over at equinoxes. Speed 5–20 km/min with maximum at 10. No correlation with auroras or weather. *Subject Headings:* **1. Ionospheric winds 2. Western Australia.**—*C.E.P.B.*

## MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

*See also:* **Physics of atmos.** (Čadež), 4.11–6; **Diffusion, entrainment, frictional drag associated with non-saturated buoyant air rising through turbulent air mass** (Bunker), 4.11–195.

4.11–105 551.511:551.596

Čadež, Marjan, **Über die Strömung der inneren und der kinetischen Energie in der Atmosphäre.** [On currents of internal and kinetic energy in the atmosphere.] *Beiträge zur Geophysik*, 63(2):130–144, **1953.** 2 figs., 2 refs., 26 eqs. **DWB**—In addition to material transport of air in one direction (wind) there are innumerable longitudinal wave impulses (compression and rarefaction) radiating in all directions with the velocity of sound, e.g., from the centers of cyclones, and carrying energy. The equations of these energy waves and their decay are set out but the energy transport is small and cannot be calculated. *Subject Headings:* **1. Acoustical phenomena 2. Energy dispersion.**—*C.E.P.B.*

4.11–106 551.511

Čadež, M., **Potencijalna energija raspodele vazdušnog pritiska i Bernoulli-Bjerknes-ova jednačina.** [Potential energy of the pressure distribution and the Bernoulli-Bjerknes equation.] *Yugoslavia. Hidrometeorološka Služba, Hidrometeorološki Glasnik*, 1(2):98–104, **1948.** 4 refs., eqs. In Croatian. **DWB**—The Bernoulli-Bjerknes formula is developed through a series of equations and explained. Potential energy in an air mass is expressed both as a function of gravitation and gradient forces without regard to surrounding air masses, and as a function of temperature and pressure differences between adjoining air masses. The transformation of potential energy into kinetic energy is illustrated by the example of an imaginary vessel which would contain a vertical column of the atmosphere and in which a transformation of energies would take place if it were moved into a horizontal position. *Subject Headings:* **1. Potential energy 2. Energy transformation 3. Bernoulli-Bjerknes equation.**—*G.T.*

4.11–107 551.511:551.551:532.5

Cârstoiu, I., **Sur le mouvement des files de tourbillons alternés d'un seul côté.** [On the dynamics of rows of successive vortices unlimited on one side only.] *Disquisitiones Mathematicae et Physicae*, Bucharest, 6(1/4):225–233, **1948.** refs., 19 eqs. At head of t-p: Publicatiile Institutului de Cercetâri Ştiinţifice. . . . **DWB**—When a cylinder is moved forward in a smooth water basin at a steady speed with its generatrix in a perpendicular position, the water behind the cylinder, after an initial turbulent stage, will produce two rows of successive vortexes. Dynamic properties of such vortexes were calculated by VON KÁRMÁN on the assumption that the movement of the vortexes is unlimited in all directions. SYNGE made the calcula-

tions for a series of vortexes unlimited behind the cylinder only, adding two new vortexes at determined periods of time. In the present study the author offers mathematical definitions of vortexes based on SYNGE's method, but without adding new vortexes and assuming that the presence of the cylinder could be disconsidered at a given moment. *Subject Headings:* **1. Turbulence 2. Vortexes 3. Hydrodynamics. I. Romania. Institutut de Cercetâri Ştiinţifice.**—*G.T.*

4.11–108 551.511

Cramer, Harrison E. and Record, Frank A., **The variation with height of the vertical flux of heat and momentum.** *Journal of Meteorology*, 10(3):219–226, June **1953.** 4 figs., 6 tables, 19 refs., 7 eqs. **MH-BH**—Series of values of shearing stress, heat flux, eddy viscosity, eddy conductivity, surface drag and VON KÁRMÁN's coefficient $k$ were obtained using hot wire anemometers, bivanes and fast response thermocouples at intervals between 2 and 12 m on a mobile tower near Buzzards Bay, Mass., over rough land and in air blowing from the sea. The variations with height were complex and differed by day and night and from land to sea; they are discussed in detail. *Subject Headings:* **1. Heat transfer 2. Momentum transfer.**—*C.E.P.B.*

4.11–109 551.511:551.513.1:551.515

Gambo, K. (*Tokyo Univ.*), **On the dynamics of planetary waves and the role of the Richardson number.** *Meteorological Society of Japan, Journal, 2nd Ser.*, 30(5):147–157, May **1952.** 8 refs., 5 eqs. **MH-BH**—By treating the horizontal and vertical stabilities three-dimensionally, it is shown that the criteria for stability are controlled by the value of the Richardson number, and that the ratio of the horizontal scale of atmospheric disturbances to the vertical scale plays an important role in stability. In connection with this Richardson number the relation between the parcel method and the perturbation method is also investigated. *Subject Headings:* **1. Dynamic stability 2. Richardson's number 3. Zonal perturbations.**—*Author's abstract.*

4.11–110 551.511

McIntyre, D. P., **Organization of kinetic energy realised in the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 79(341):411–413, July **1953.** 3 figs., 3 refs. **DWB**—It is pointed out that the complete release of thermo-dynamic energy by overturning assumed by M. MARGULES and SIR C. NORMAND is not realized in practice because solenoid and cyclonic terms also develop. In the example given only about half the potential energy is realizable. *Subject Headings:* **1. Energy transformation 2. Enthalpy.**—*C.E.P.B.*

4.11–111 551.511

Tojo, Sadayoshi, **The dynamics of a vortex embedded in a constant zonal current.** *Journal of Meteorology*, 10(3):175–178, June **1953.** 3 figs., 2 refs., 30 eqs. Also in: *Geophysical Magazine*, Tokyo, 24(2), Nov. **1952.** 2 refs., 27 eqs. **MH-BH**—A nondivergent frictionless barotropic wind field is assumed in which a vortex with axial symmetry is superposed on a uniform zonal current. Expressions for the "circle of compensation" (around which cyclonic component vanishes and inside which net vorticity is zero), speed of propagation and pressure-height field are derived. Maximum cyclonic component has a radius of curvature half radius of compensation. *Subject Heading:* **1. Vorticity theory.**—*C.E.P.B.*

4.11–112 551.511

Van Mieghem, Jacques (*Brussels Univ.*), **Energy conversions in the atmosphere on the scale of the general circulation.** *Tellus*, 4(4):334–351, Nov. **1952.** 47 eqs., bibliog. p. 351. **MH-BH**—From the equations of balance established for the different forms of energy (potential, kinetic and internal energies), the energy fluxes, the rates of energy production and conversion are deduced. Provided weighted mean values are considered the zonally averaged value of the kinetic energy may be decomposed into kinetic energy of the mean motion and the mean kinetic energy of the large-scale eddies. The corresponding equations of balance are established. The axial symmetry with respect to the earth's axis allows the introduction of the kinetic energy of the zonal motion and of the motion in the meridional planes. Their equations of balance are given. The conversions between the different species of mechanical

energies are envisaged and the influence of the inertial stability on the conversion of "mechanical" eddy-kinetic energy into "zonal" eddy-kinetic energy is pointed out. The definition of the large-scale eddy diffusion of heat is deduced from the first law of thermodynamics. This definition contains the flux of "sensible heat" as an approximation. Neglecting viscosity and small-scale turbulence, the general formulas are applied to the large atmospheric disturbances. A tentative formation of the second law of thermodynamics is given. *Subject Headings:* **1. Energy exchange 2. Energy transformation 3. Atmospheric circulation.**—*Author's abstract.*

## GENERAL CIRCULATION

*See also:* **Isoline propagation** (Sherman, Riehl), 4.11–78; **Dynamics of planetary waves, role of Richardson number** (Gambo), 4.11–109; **Experimental models of polar-front wave** (Fultz), 4.11–131; **Upper westerlies; wind field structure E. North Atlantic, W. Europe, Jan. 1950** (Johnson), 4.11–193; **Statistical study of precip. distribution as related to mean zonal motions** (Jenista), 4.11–220.

4.11–113 551.513.1

Smagorinsky, J., **The dynamical influence of large-scale heat sources and sinks on the quasi-stationary mean motions of the atmosphere.** *Royal Meteorological Society, Quarterly Journal,* 79(341):342–366, July **1953.** 7 figs., 39 refs., 63 eqs. **DWB**—The atmospheric circulation cannot be explained by the classical convective theory of large-scale zonally asymmetric heating and cooling. Since large mountain barriers (half-width about 1000 km) can produce large scale quasi-static and quasi-geostrophic planetary waves, heat sources and sinks of planetary dimensions which cause monsoons should also produce similar perturbations. The various sources and losses of heat at various levels in the atmosphere are evaluated and N. Hemisphere charts of normal winter and summer non-adiabatic heating and cooling shown. A theoretical heating model is constructed and the perturbations due to heat sources and sinks calculated, with and without friction. The results show general agreement with broad observed features when orographic effects are allowed for. *Subject Heading:* **1. Atmospheric circulation.**—*C.E.P.B.*

4.11–114 551.513.2:551.510.52/3

Goldie, A. H. R., **Global circulation of air at high level and mechanism of change of tropopause level.** *Meteorological Magazine,* London, 82(973):198–210, July **1953.** 4 figs. 4 tables, 10 refs. **MH-BH**—Temperatures at Larkhill, Eng., are plotted in relation to tropopause level and temperature at equator (Jan., July). Inferring that air in lower stratosphere of mid- and high latitudes has drifted from upper 4 km of tropical troposphere, it is found from average temperatures in mid-latitudes, tropopause to 18 km, that 62% in winter and 36% in summer of heat gained by adiabatic subsidence is lost by radiation. Daily rate of loss 0.5°F. in winter and 0.25°F. in summer. In polar regions radiation loss equals or exceeds adiabatic gain. *Subject Headings:* **1. Global circulation 2. Temperature of the stratosphere.**—*C.E.P.B.*

4.11–115 551.513.3:551.515.7(5)

Ishimaru, Yukiti (*Fukuoka Dist. Central Met. Obs.*), **The circulation of the atmosphere over the Far East Asia. (Part I).** *Geophysical Magazine,* Tokyo, 23(4):379–388, May **1952** fig., map, 12 charts, 7 refs. **MH-BH**—On the basis of wind and pressure data for Manchuria Japan, Mongolia, China, etc. monthly maps of prevailing wind direction and pressure distribution over the Asiatic Far East have been constructed in order to determine the position of the action center of the Asian or Siberian high pressure. A detailed discussion of the seasonal mean air current and pressure distribution is presented. The Asian continental high pressure exists throughout the year; its center splits in two parts during March–Aug. (one over Koldo Plateau and the other over the Tibetan Plateau), but during Sept.–Feb. its center is located over the Turfan district. "The areas of the active source in the Far East are situated over the north or northwestern plateau of Outer Mongolia and Tibet Plateau." *Subject Headings:* **1. Anticyclones 2. Centers of action 3. Asia.**—*I.L.D.*

## ATMOSPHERIC DISTURBANCES

*See also:* **U. S. Met. Yearbook** (U. S. Weather Bureau), 4.11–42; **Forecasting speed of movement of selected cyclones** (Rampey), 4.11–74; **Dynamics of planetary waves, role of Richardson number** (Gambo), 4.11–109; **Atmos. circulation, Far East** (Ishimaru), 4.11–115; **Gale, Dec. 17, 1952, Scotland, England** (Douglas), 4.11–185.

4.11–116 551.515.127(52):551.557

Ooi, S., Matsumoto, S. and Itoo, H., **A study on westerly troughs near Japan** (I). *Papers Meteorology and Geophysics*, Tokyo, 2(3/4):219–233, Dec. **1951.** 21 figs., 9 refs. Ooi, S., Matsumoto, S., Itoo, H. and Arakawa, A., . . . (II). *Ibid.*, 3(1):1–11, March **1952.** 13 figs., maps., 7 refs. Matsumoto, S., Itoo, H. and Arakawa, A., . . . (III). *Ibid.*, 3(4):229–245, March **1953.** 18 figs., table, 20 refs. **MH-BH**—Using time-altitude sections for the temperature up to the 50 mb level, time sections of temperature and height of 4 standard pressure levels and cross sections for a certain profile in Jan., Feb. 1950 and 1951, the authors investigate the vertical structure of the upper westerly trough near Japan. The variation of stratification and distribution of the solenoid field, convergence and divergence are discussed. Remarkable temperature variations in the upper trough are explained by vertical motion. In the second part similar methods are used with an additional combined presentation of time-altitude section for temperature with height anomalies of pressure levels. The westerly component of geostrophic wind on the 400 mb level was analyzed in a latitude-time section. The authors found that divergence in upper atmosphere coincides with the transit of the jet stream. Solenoidal effect was found negligible but effect of divergence should be considered when computing vorticity change. In the third part an additional wind field analysis is given showing the relation between the trough and the divergence field. The characteristic temperature field in a trough is explained by vertical motion. A three-dimensional large scale model of atmospheric disturbances is presented. *Subject Headings:* **1. Synoptic studies Westerly trough 3. Jet stream 4. Japan.**—*A.A.*

4.11–117 551.515.13(47)

§Bel'skaia N. N., **IUzhnye tsiklony i usloviia ikh peremeshscheniia na evropeĭskuiu territoriiu SSSR.** [Southern cyclones and their movement into European U.S.S.R.] *U.S.S.R. Tsentral'nyĭ Institut Prognozov, Trudy*, 17(44):64–113, **1949.** 26 figs., 6 tables, 25 refs. **DLC**—The processes causing cyclone formation over the Mediterranean and the Black Sea depend on the thermobaric field of troposphere and on orographic effects. Usually the formation of cyclones is related to two systems of atmospheric circulation, meridianal transfer of air masses or a north-eastern stream, especially over north and middle parts of continent. Of southern cyclones coming to European U.S.S.R., 48% are formed in the western part of the Mediterranean, and 52% west of Black Sea. The important phenomenon observed during the formation of Black Sea cyclones is the increase of pressure and thermal gradient over Hungarian and Danube valleys. At such times the zone of great temperature differences located over the southern seas and tropospheric cold air penetrates from southern Urals to Alps, the Mediterranean cyclones enter the Black Sea and southern part of Russia, especially when the angles between isohypses and isotherms before cyclone are greater than 45°. *Subject Headings:* **1. Cyclone tracks 2. U.S.S.R.**—*N.T.Z.*

4.11–118 551.515.2(676,267)

§Sansom, H. W. (*comp.*) (*E. African Met. Dept.*), **The Lindi cyclone, April 15, 1952.** *East Africa High Commission. Meteorological Dept., Memoirs*, 3(1), **1953.** 16 p. 3 figs., tables. Price: Sh. 3/50. **DWB**—There has been no authentic report of the passage of a tropical cyclone from the Indian Ocean over the east coast of Africa since 1872. The cyclone described in this paper was short but intense. Its description is based mainly on eye witness reports and records obtained at Lindi (10°S.) and aboard two ships. Rainfall amounts, pressure records and wind estimates are presented and the general development of the storm is described. *Subject Headings:* **1. Tropical cyclones 2. British East Africa 3. Indian Ocean.**—*G.T.*

4.11–119 551.515.2(73/9):656.6

Snow, Edward Rowe, **Great gales and dire disasters.** New York, Dodd, Mead, 195 263 p. plates. **DWB**—A series of naratives giving details of a score of sensational disaste in the coastal regions of the U. S.—many of which were caused by weather. Notable amor these is the Galveston hurricane of 1900; the Morro Castle disaster; the great New Yo snowstorm of March 1888; the November gale and blizzard of 1950; the major storms whi resulted in numerous wrecks between 1723 and 1870 around Gloucester with an alphabetic list of about 5000 ships thus lost (1830–1951) and a loss of life of over 8200 fishermen; and t gale in Feb. 17, 1952 which did great damage in New England and resulted in the breaki in half of two tankers (with waves estimated at 50 to 68 ft). Only one chapter is devoted Pacific Coast storms and shipwrecks. *Subject Headings:* **1. Marine disasters 2. Histor storms 3. Shipwrecks 4. Atlantic Coast, United States.**—*M.R.*

4.11–120 551.515.2

Fujita, T. (*Kyushu Inst. of Technology, Tobata*), **Pressure distribution within typhoo** *Geophysical Magazine*, Tokyo, 23(4):437–451, May **1952.** 13 figs., 3 tables, 15 refs. **MI BH**—The formulas of K. TAKAHASHI and of BJERKNES for representing typhoon pressure a combined into a single expression and with the addition of a fourth constant, the radius rat characterizing the pressure curves, this expression describes satisfactorily typhoon pressur The function containing this constant, termed the cyclone function, can be used to descri the form of typhoon pressure in various stages and is applicable also to continental cyclone Tables giving values of the cyclone function, the values of the radius ratio and of the oth constant are given. Typhoon pressures were computed and compared with the observe pressures and the anomalies; the difference between these pressures, was computed for t Muroto typhoons. The characteristics of minor troughs within typhoon "Della" of June 2 1949 indicate that they were followed not only by cyclonic circulation around the troug center. *Subject Heading:* **1. Typhoon pressure.**—*I.L.D.*

4.11–121 551.515.4(495):551.590.2

Karapiperis, Leonidas N., **The moon and the thunderstorms.** *Beiträge zur Geophysi* 63(2):145–148, **1953.** 20 refs. **DWB**—Thunderstorms in 1901–40 in Greece were slight more numerous in first and new moon quarters than in other quarters, especially April–Sep and slightly greater near perigee than apogee. No influence of declination was found. *Subje Headings:* **1. Thunderstorm frequencies 2. Lunar influences 3. Greece.**—*C.E.P.B.*

4.11–122 551.515.4:551.578.72(4

Favrot, Cl. (*Secretary, Commission Consultative de Météorologie du Rhône*), **Contributi à la climatologie du Lyonnais: les orages.** [Contribution to the climatology of the Ly region: thunderstorms.] *Revue de Géographie de Lyon*, 28(1):45–51, **1953.** 5 tables. **DWB** Data on the frequency distribution of thunderstorms and hailstorms and on their direction origin, as well as on damage caused by them, are tabulated for the periods 1885–1910 a 1922–1951. It is found that the majority of thunderstorms originate in the SW; thunde storms are most frequent in May–Aug., hailstorms in July; they usually occur in the afternoo Damages caused by hailstorms up to 1914 have been estimated at over 4.5 million fran yearly. *Subject Headings:* **1. Thunderstorm frequencies 2. Hailstorm frequencies 3. Stor damage 4. Long period records 5. Lyon Region, France.**—*G.T.*

4.11–123 551.515.4(7

*Longley, Richmond W., **Thunderstorm data for Canada.** *Canada. Meteorologic Division, Cir.* 2159, Tec. 121, Sept. 16, **1952.** 8 p. mostly tables, 17 charts. **DWB** Weather reports from all first order stations, supplemented by data from climatologic stations where observations were made once or twice a day, were the basis of this repor Data for the period 1941–1950 only were used because of the limited number of statio reporting before 1940. Figures give monthly, seasonal and annual number of days wi thunderstorms. Table lists approximately 200 stations with monthly and annual mea number of days with thunderstorms and the period of record. *Subject Headings:* **1. Thunde storm data 2. Canada.**—*M.L.R.*

4.11–124 551.515.42:551.577.37(773)

Huff, F. A. and Stout, G. E. (*Urbana, Ill.*), **Area-depth studies for thunderstorm rainfall Illinois.** *American Geophysical Union, Transactions,* 33(4):495–498, April **1952.** 7 figs., refs. **MH-BH**—The area-depth relationships of individual thunderstorm rainfall in three nall densely gaged watersheds (5.2, 95, and 280 sq. mi.) in central Illinois were investigated. he data approach a relationship $Y=a+bx^{\frac{1}{2}}$, where $Y$=average rainfall depth in inches, =area in square mi, and $a$, $b$ are constants. This relationship was tested on storms ranging om one to eighteen hours' duration on 95 and 280 sq. mi. basins and for duration of thirty inutes to several hours on 5.2 sq. mi. basin. Satisfactory agreement with the formula as found in most tests. *Subject Headings:* **1. Thunderstorm rainfall 2. Rainfall depth ıration studies 3. Illinois.**—*I.L.D.*

4.11–125 551.515.42(431/5)

*Israël, Hans, **Gewitterbeobachtungen in Südwestdeutschland.** [Thunderstorm observaons in SW Germany.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte,* No. :63–66, **1952.** 3 tables, 9 refs. **DWB**—Tables summarize observations 1947–48 in French one—days with near and distant thunder, precipitation, duration of near storms. Yield water $4–5\times10^{11}$ gr per storm per hour. *Subject Headings:* **1. Thunderstorm data 2. Germany.**—*C.E.P.B.*

4.11–126 551.515.7:551.524.7:551.547.3

Vederman, Joseph (*U. S. Weather Bur., Wash., D. C.*), **The growth and decline of anticlones.** *American Meteorological Society, Bulletin,* 33(8):315–321, Oct. **1952.** 10 figs., refs. **MH-BH**—The prediction of changes in intensity of anticyclones depends upon a nowledge of the changes in height, temperature and thickness in the lower and mid-troposphere nd at the tropopause that are associated with increases or decreases in the central pressure of a level anticyclones. Accordingly, changes of heights and temperatures of the standard essure surface of 40 sea level anticyclones which occurred in the eastern United States during e colder season, were investigated. "The average decreasing High was associated with sing constant-pressure surfaces above 850 mb, rapidly rising temperatures from 850 to 300 b and slowly falling temperatures above. The average increasing High was associated with rise of all constant-pressure surfaces, slowly rising surfaces from 850 to 300 mb and falling mperatures above 300 mb. In most cases increasing Highs had a northward component of otion; decreasing Highs a southward component." *Subject Headings:* **1. Anticyclones Upper air temperatures 3. Constant pressure surfaces.**—*I.L.D.*

4.11–127 551.515.7(431/5)

Würfel, Heinz, **Hochdruckbereitschaft in Mittel- und Südwestdeutschland.** [High essure tendencies in middle and southwest Germany.] *Zeitschrift für Meteorologie,* 6(6):181–8, June **1952.** 3 figs., 18 refs. **MH-BH**—The author reviews the development of ncept of high pressure tendency and its mathematical-statistical determination and the plication of the method of its determination by A. Peppler to southwest Germany. In view the fact that the characteristic "anticyclonic isobaric curvature" as a sole designation high pressure tendency does not adequately typify weather processes, the description of the uses of high pressure tendencies are supplemented by the designation of clear and cloudy ys. *Subject Headings:* **1. High pressure tendency 2. Anticyclones 3. Germany. Peppler, A.**—*I.L.D.*

4.11–128 551.515.727:550.38

Sparkman, J. W., Jr. (*Air Trans. Sq. 22, NAS Norfolk, Va.*), **Geomagnetic conditions d the development of pressure ridges.** *American Meteorological Society, Bulletin,* 33(8): 8–350, Oct. **1952.** 6 figs., 3 refs. **MH-BH**—A further test of the observation (*American eteorological Society, Bulletin,* 32(8):282–288, Oct. 1951), that a gradient of geomagnetic ange between Tucson, Arizona and Cheltenham, Maryland is followed by the development a pressure wave in the westerlies over eastern United States for example over Wash., D. C. om the geomagnetic records of Tucson and Cheltenham for Oct. and Nov. 1919–1936, days ve been selected with the greatest gradient between the two stations and using these days

and noting each as "zero day" the author plotted "average surface pressures for each day of th six-day period '−2 day' through '+3 day'." These pressure conditions are reproduced. It i concluded that the existence of pressure ridges on the second and third days after the geo magnetic condition is not mere coincidence. *Subject Headings:* **1. Upper anticyclones 2. Mag netic disturbances.**—*I.L.D.*

4.11–129 551.515.73(5):551.583.1

Yamamoto, Takeo (*Yamaguchi Univ.*), **On the secular change of the North Pacific High** *Meteorological Society of Japan, Journal*, 29(12):415–418, Dec. **1951.** 5 figs., 6 refs. **MH BH**—Continuous observation records of meteorological conditions in Seoul (Korea) an Japan for over 200 years are used to investigate secular climatic changes under the influenc of the North Pacific High. Results of tree ring investigations, concerning the period 1300 1700 A.D., are shown. It seems that the climate of the Far East has a remarkable secula trend and well expressed variations; for example, the tree rings show periods of about 12 years, and the precipitation data show an increase from the end of the 18th century to the en of the 19th century. *Subject Headings:* **1. Pacific High 2. Climatic changes 3. Dendrachro nology 4. Far East.**—*A.A.*

4.11–130 551.515.8(02

§Bleeker, Wouter and Van Diujnen Montijn, J. A., **Luchtsoorten en Fronton.** [Air masse and fronts.] *Netherlands. (K.) Meteorologisch Instituut, [Uitgave]*, No. 111, *Opstellen o Oceanografisch en Maritiem Meteorologisch Gebied* [No.] 9 a, **1949.** 122 p. 71 figs., 6 table refs. **DWB**—A concise text for map analysts or forecasters on ships giving the latest ideas o classification of air masses, source regions, homogeneity; vertical instability and structure adiabatic processes, horizontal instability, use of aerological diagrams; water vapor in atmos phere, cloud and rain forming processes; properties of warm and cold air masses, modificatio of air masses; model fronts and frontal surfaces, types (physical and geographical) of fronts waves and depressions in fronts, frontless systems (lows and highs), and applications to weathe map analysis, especially on board ships at sea. *Subject Headings:* **1. Air masses 2. Front 3. Textbooks 4. Synoptic analysis 5. Marine meteorology.**—*M.R.*

4.11–131 551.515.8:551.51

Fultz, Dave, **On the possibility of experimental models of the polar-front wave.** *Journ of Meteorology*, 9(6):379–384, Dec. **1952.** 6 figs., 6 refs. Also: Chicago. University. Dep of Meteorology, Contract AF19(122)-160, Scientific Report No. 4, [**1953**]. **DWB**—Describe and illustrates model experiments in which polar-front type perturbations, cyclones and je such as appear on upper level synoptic charts, namely: 1) two homogeneous immiscib liquids in a rotating circular disk, 2) water in a rotating pan heated at outer edge and coole at "pole." Similarities to atmosphere remarkably close. *Subject Headings:* **1. Polar front 2. Planetary circulation. I. Chicago. University. Dept. of Meteorology II. Contra AF19(122)-160.**—*C.E.P.B.*

4.11–132 551.515.

Jae, Jeou-jang and Guh, J. S., **Die Entartung der Warm- und Kaltluftmasse durch di Wirkung des Austausches.** [Degeneration of the warm and cold air masses through th effect of exchange.] *Academia Sinica. Institute of Meteorology, Scientific Papers, Co tribution* No. 170, **1948.** 14 p. 6 figs., 12 refs., 30 eqs. Reprint from: *Chinese Geophysic Society, Journal*, 1(1), June **1948. DLC**—With the aid of the differential equation for tu bulent exchange the authors develop formulas for calculating the temperature and absolu humidity of warm and cold air masses for: 1) conditions without temperature inversion an 2) conditions with a temperature inversion. Numerical calculations of the temperature an humidity distribution in a cold air mass are given. It is shown that the temperature inversi influences conservation of the air masses. *Subject Headings:* **1. Air masses 2. Turbule exchange 3. Austausch.**—*I.L.D.*

4.11–133 551.515.8

Macdonald, John D. (*Hq. Air Weather Ser., Wash., D. C.*), **On the formation of squall lines.** *American Meteorological Society, Bulletin*, 33(6):237–239, June **1952.** charts, 8 refs. **MH-BH**—The hypothesis is proposed that the "genesis of squall lines, their linear structure, propagation and dissolution are due primarily to horizontal *variations* of warm-air advection in the layer below 10,000 feet MSL." A method of forecasting the development of squall lines involving the supplementing of ordinary constant-pressure charts with hodographs of six-hourly intervals is illustrated with the aid of a series of charts. *Subject Headings:* **1. Squall lines 2. Squall line forecasting.**—*I.L.D.*

4.11–134 551.515.8:551.509.312

*§Sumner, E. J., **Cold pools: a statistical and synoptic study.** *Great Britain. Meteorological Research Committee, M.R.P.*, 764, Oct. 31, **1952.** 13 p. 7 figs., 7 tables, 3 refs. Mimeo. **DWB**—Thickness (1000-500 mb), intensity and movement of cold pool centers in 60°W.–0°E. south of 80°N. are plotted and tabulated; mainly late spring and early summer. Mean duration 3 days. Origin (mostly by cutting off a cold trough) examined. Associated pressure systems are classified into 6 types and distribution discussed. Tables and graphs show surface pressures at centers of pool and of associated high or low, cloud frequencies, type of precipitation and central thickness. Forecasting applications are considered. *Subject Headings:* **1. Cold pools 2. Upper air analysis.**—*C.E.P.B.*

4.11–135 551.515.8

Virgo, S. E., **Cold pools.** *Meteorological Magazine*, London, 82(969):81–86, March **1953.** 3 eqs. **MH-BH**—Discussion of papers by W. Buschner (*see item* 3.9–111, Sept. 1952, *MAB*) and P. Fontaine, "Les 'gouttes d'air froid' sur l'Europe, la Méditerannée et l'Atlantique Est" (*See item* 4.6–115, June 1953, *MAB*.) Several speakers described researches in the British Meteorological Office and questions of definition and terminology and T. H. Kirk discussed, mathematically, statement that anticyclonic conditions may occur ahead of the cold pool and cyclonic conditions behind it. *Subject Heading:* **1. Cold pools.**—*C.E.P.B.*

4.11–136 551.515.81:551.577

Faust, H., **Die Mannigfaltigkeit der atmosphärischen "Fronten."** [The variety of atmospheric fronts.] *Umschau*, 53(8):225–227, April 15, **1953.** 2 figs. **DWB**—Three types of active cold front are described, giving pre-, pre- and post-, and post-frontal precipitation. These are related to stable (S), stable-labile (H, principal type) and labile (L) stratification. Stable and labile warm fronts and masked or unmasked fronts are also distinguished. *Subject Headings:* **1. Frontal structure 2. Rain squalls.**—*C.E.P.B.*

## RADIATION AND TEMPERATURE

### RADIATION

*See also:* **Conference on Sun in Service of Man,** 4.11–4; **Sky color** (Bullrich, deBary, Möller), **4.11–5; Air mass between observer and outer space** (Pressly), **4.11–35; Determination of water vapor in atmos.** (Toropova), **4.11–54; Corpuscular influences of upper atmos.** (Chapman), **4.11–88; Solar activity and atmos.** (Koppe), **4.11–267.**

4.11–137 551.521

Mandel'shtam, S. L., **Obzor rabot po issledovaniiu korotkovolnovoĭ ul'trafioletovoĭ radiatsii solntsa.** [Outline of investigations of short wave UV solar radiation.] *Uspekhi Fizicheskikh Nauk*, Moscow, 46(2):145–178, Feb. **1952.** 19 figs., 4 tables, 31 refs. **DLC**—A review of results of investigations carried out during recent years in the U. S. by means of rocket-borne optical equipment (V-2 ascents) attaining a height of 150 km. After pointing out the paramount importance of investigating short wave UV radiation for the knowledge of the physics of the earth and the sun the author evaluates and discusses the results achieved in two groups of investigations. The first investigated the sun's spectrum with aid of spectrographs in the region between 3000 and 2000 Å, while the second measured the radiation flux in

the section between 2000 and 0 Å without spectral differentiation by separating narrow spectr intervals. *Subject Headings:* **1. Ultraviolet radiation 2. V-2 rockets.**—*A.M.P.*

4.11–138 551.52

Riblet J. (*Obs. of Lyon, and of Haute-Provence*), **Problèmes d'insolation. Perspectograph stéréographique (système J. Riblet) appliqué à la determination de la réduction par les ob stacles des durées d'insolation.** [Problems of insolation. Riblet's system of stereograph perspectograph applied to the determination of the reduced duration of insolation due t obstacles.] *Revue de Géographie de Lyon*, 27(4):391–412, **1952.** 14 figs., 24 refs. **DWB**— Author invented a simple optical device, working under field conditions at any given poin for the graphical computation of the real possible sunshine duration for all seasons, takin into account the obstacles on the horizon. A systematic semipopular review on solar radiatio phenomena is given, emphasizing geometrical relationships which are presented graphically *Subject Headings:* **1. Sunshine duration 2. Solar radiation.**—*A.A.*

4.11–139 551.521.12(5

*IAroslavtsev, I. N., **Poludennye velichiny napriazheniia priamoĭ solnechnoĭ radiatsii Tashkente.** [Midday value of intensity of direct solar radiation at Tashkent.] *Meteorologi i Gidrologiia*, No. 5:30–33, **1952.** 2 figs., 5 tables, 6 refs. **DLC**—First observations of sola radiation were made in Central Asia at Pamir in 1901 by A. V. STANKEVICH and later in 190 near Tashkent by N. A. KOROSTELEV. The author presents the summary of systemat observations made in Tashkent during the last 25 years (1926–1950), which show that th maximum of midday direct solar radiation was recorded as 1.50 cal/cm² and minimum as 1.2 cal/cm². The absolute maximum of direct radiation was recorded on March 9, 1929 as 1.5 cal/cm². The most intensive radiation at Tashkent is usually observed in March and th lowest in Oct. The variations of monthly mean midday values of direct radiation and turbidit factor (for dry and wet turbidity) are shown on a graph for the period 1934–1950. Th comparison of mean maximum ranges for many points of Central Asia, located betwee latitudes 41.9° to 35.3° and altitudes from 242 m to 4170 m above sea level, showed that th ranges of the maximum radiation depended on latitude, altitude above sea level and loca climatic conditions. *Subject Headings:* **1. Solar radiation 2. Turbidity factor 3. Lon period records 4. Tashkent, U.S.S.R.**—*N.T.Z.*

4.11–140 551.521.16:551.577.3

Atkins, W. R. G. and Jenkins, Pamela G., **Reduction in light accompanying exceptionall heavy rain.** *Nature*, London, 172(4367):79, July 11, **1953.** fig., table. **DWB**—Diurna variation of illumination in kilolux/hour at Plymouth on Aug. 10 and 14, 1952 (fine), Aug. 1 (overcast) and Aug. 15 (82 mm rain from CuNb, Lynmouth floods) is shown by curves. O Aug. 15 illumination fell at times to 0.5% of unobscured sunlight. *Subject Headings:* **1. Day light illumination 2. Excessive rainfall.**—*C.E.P.B.*

4.11–141 551.521.16:72

Schulze, Rudolf, **Licht und Wohnung—Strahlungsgenuss geneigter Flächen.** [Light an housing—advantage of radiation on inclined surfaces.] *Annalen der Meteorologie, Medizin Meteorologische Hefte*, No. 8:126–140, **1953.** 17 figs., table, 9 refs. **DWB**—This useful pape discusses in detail measurements of radiation and illumination through windows and o vertical and inclined surfaces of different aspect. "Daylight quotient" (illumination rati room/open) is examined for windows of different shapes and slopes. Daily records of sun+sk radiation on external surfaces are shown as ratios to horizontal surface and spectral distributio (clear and cloudy days) illustrated. Quality of light in living rooms is discussed, includin important effects of colors of walls, floor and ceiling. *Subject Headings:* **1. Daylight illuminatio 2. Building design.**—*C.E.P.B.*

4.11–142 551.521.3:551.59

Scheer, Georg (*Darmstadt, Germany*), **Lesen von Druckschrift als Mass für die Helligkei** [Reading of print as a measurement of brightness.] *Wetter und Leben*, 4(8):118–121, Sep **1952.** fig., 11 refs. **MH-BH**—The measurement of total illumination brightness consists

letermining the time at which print can be read. The illumination brightness at which print ould be read measured in lux varied throughout the year by as much as 100%. Possible hysiological reasons for this variation, such as vitamin A content of nutrition and an internal hysiological rhythm as expressed in the diurnal rhythm of vital functions are discussed. *Subject Headings:* **1. Illumination intensity 2. Turbidity 3. Physiological factors in visibility.** —*I.L.D.*

4.11–143 551.521.31

Anthony, Romuald, **Observation of non-Rayleigh scattering in the spectrum of the lay sky in the region 0.56 to 2.2 microns.** *Journal of Meteorology*, 10(1):60–63, Feb. **1953.** figs., 7 refs. **MH-BH**—Spectra of skylight 0.56–2.2$\mu$ at 2200 and 5415 ft in Mojave desert 80–4° from sun at sun height are reproduced. Large scatter found in 1.0–2.2$\mu$ within 30° f sun. Comparison with direct solar rays shows approach from high scattering of infrared o Rayleigh scattering at increasing distance from sun up to 80°. Ratio scattered/direct adiation is given by Const $-4 \log \lambda$. Particle size estimated as 0.5$\mu$ for visible and 3.5$\mu$ for nfrared radiation. *Subject Headings:* **1. Scattering of light 2. Sky radiation.**—*C.E.P.B.*

4.11–144 551.521.31:551.521.6

Curcio, J. A., Drummeter, L. F., Petty, C. C., Stewart, H. S. and Butler, C. P., **An experimental study of atmospheric transmission.** *Optical Society of America, Journal*, 43(2):97–102, Feb. **1953.** 10 figs., 3 tables, foot refs. **DWB**—An experimental investigation was made to determine the general characteristics of the spectral transmission of the atmosphere in the vicinity of Washington, D. C., on the Chesapeake Bay, in the Gulf of Mexico, and in the Central Pacific. Transmission measurements were made at the wavelengths of approximately 15 of the Hg discharge lines in the interval 2500A to 6000A. Values of the spectral atmospheric attenuation coefficients ($km^{-1}$) have been computed. For all observations made, these values increase toward shorter wavelengths and this is most pronounced for wavelengths below 3200A, where true absorption as well as scattering contributes to the attenuation. *Subject Headings:* **1. Atmospheric absorption 2. Scattering coefficient.**—*Authors' abstract.*

4.11–145 551.521.32:551.521.61

Godson, W. L., **The evaluation of infra-red radiative fluxes due to atmospheric water vapour.** *Royal Meteorological Society, Quarterly Journal*, 79(341):367–379, July **1953.** fig., tables, 22 refs., 20 eqs. **DWB**—An empirical method of evaluating the integrated radiative flux over a narrow spectral interval in a layer of variable pressure, temperature and composition with various transmission functions is described. An integration technique is developed for an assemblage of layers and illustrated for two or three layers. This is applied to radiation charts of Elsasser, Robinson and Yamamoto and it is found that temperature effects are not sufficiently taken into account. A procedure is proposed in which the absorbing mass of each layer is corrected to standard pressure and temperature, but the experimental data for this are not yet adequate. *Subject Headings:* **1. Outgoing radiation 2. Infrared radiation.**—*C.E.P.B.*

4.11–146 551.521.32

Goody, R. M., **Equations of transfer for the total flux of terrestrial radiation.** *Royal Meteorological Society, Quarterly Journal*, 79(340):282–283, April **1953.** 5 refs., 6 eqs. **DWB**—The only two approximate equations for total flux of radiation developed by D. Brunt and S. L. Malurkar and L. A. Ramdas, cannot be used for simple calculations because conditions of validity cannot be defined. *Subject Heading:* **1. Terrestrial radiation.**—*C.E.P.B.*

4.11–147 551.521.32

Horak, Henry G. (*Kansas Univ.*), **The transfer of radiation by an emitting atmosphere.** *Astrophysical Journal*, 116(3):447–490, Nov. **1952.** 4 figs., 6 tables, foot-refs., eqs. **DWB**—The transfer of radiation by a plane-parallel atmosphere containing a uniform distribution of emission sources is considered for two cases: (*a*) isotropic scattering with an albedo $w_o$, (*b*) scattering according to the asymmetric phase function $w_o(1+x \cos \theta)$. The exact expressions for the emergent intensity are derived for both semi-infinite and finite atmospheres. It is also

shown how the intensity at any optical depth may be obtained. The formulae are applied to the case of the galactic light. *Subject Headings:* **1. Emission layers 2. Outgoing radiation** —*Author's abstract.*

4.11–148 551.521.32:536.3

King, Jean I., **Line absorption and radiative equilibrium.** *Journal of Meteorology*, 9(5) 311–321, Oct. **1952.** 5 figs., 4 tables, 14 refs., 41 eqs. **MH-BH.** Also in: Utah. University Dept. of Physics, Contract AF 19(122)-392, Stratospheric Radiation Technical Report, No 3, 4, Oct. **1951,** Jan. 2, **1952. DWB**—Radiative-equilibrium temperature distribution (e.t.d.'s) are derived for a line-absorbing atmosphere in which the absorption coefficients are given by the Lorentz collision-broadening formula. The line half-width is assumed strictly proportional to the pressure at all levels. The actual e.t.d. is approximated by a superposition of the e.t.d.'s of all the individual lines, with neglect of overlapping of the lines. The individual e.t.d.'s depend on the variation of mixing ratio and the position of the line relative to the black-body curve but, for strong lines, not on the line intensity. Upon comparison of the e.t.d.'s found with the standard atmosphere, conclusions are drawn about the contributions of various regions of the infrared spectrum to radiative cooling. It is found that the 6$\mu$ water-vapor band plays a small role in radiative transfer above the lower troposphere. In the upper troposphere the slopes of the e.t.d.'s are remarkably close to the standard atmosphere. Formal proofs are given that (a) any e.t.d. engenders convection near the earth's surface and (b) the isothermalcy of the stratosphere cannot be explained as an infrared e.t.d. *Subject Headings:* **1. Long wave absorption 2. Radiative equilibrium 3. Infrared absorption. I. Utah. University Dept. of Physics II. Contract AF 19(122)-392.**—*Author's abstract.*

4.11–149 551.521.32:536.33

Dobson, G. M. B., **Remarks on "Line absorption and radiative equilibrium."** *Journal of Meteorology*, 10(3):234, June **1953.** ref. **MH-BH**—Note on J. I. KING, (*see* 4.11–148 above) querying two assumptions. *Subject Heading:* **1. Long wave absorption.**—*C.E.P.B.*

4.11–150 551.521.32:551.521.61

King, Jean I. (*Utah. Univ., Salt Lake City, Utah*), **Transfer theory for purely pressure-broadened band spectra.** *Astrophysical Journal*, 116(3):491–497, Nov. **1952.** fig., refs. 28 eqs. Also as: Utah. Univ. Dept. of Physics, Contract AF 19(122)-392, Technical Report No. 5, June 2, **1952. DWB**—A complete analysis is given for the following model of atmospheric transmission: The atmosphere in local thermodynamic equilibrium without scattering the half-width of any line is proportional to the total pressure prevailing at any level. In view of the application to transfer in the far infrared bands of the earth's atmosphere, an idealized molecular band consisting of a series of equal and equidistant lines is assumed. It is possible to express the radiative cooling rates and the conditions of radiative equilibrium for this model in terms of integrals containing only elementary functions under the integral sign. For intense lines the formalism becomes greatly simplified. *Subject Headings:* **1. Infrared radiation 2. Radiation balance. I. Utah. Univ. Dept. of Physics II. Contract AF 19(122)-392.**—*Author's abstract.*

4.11–151 551.521.32

Yamamoto, Gi-ichi (*Tohoku Univ.*), **On a radiation chart.** *Tohoku University, Science Reports, 5th Ser., Geophysics* 4(1):9-23, June **1952.** 13 figs., 4 tables, 25 refs., eqs., append. **Some remarks on my paper "On a radiation chart."** *Ibid.*, 4(2):98-99, Oct. **1952. MH-BH**—A new radiation chart for calculating infrared flux due to water vapor, with auxiliary chart for carbon dioxide correction. Temperature dependence of line intensity is taken into account. ELSASSER's periodic pattern is used for small optical path by numerical integration of general expression; COWLING's curve for large optical path, assuming it to hold for small portions of band. Half-width to spacing ratio of 1:30 assumed for water vapor. CALLENDAR's carbon dioxide absorption values were used. Chart gives values of clear-sky cooling in fair agreement with LONDON's for London's data, but greater net flux at all levels and systematically larger cooling below 8 km. In his "Remarks on my paper . . ." the author revises two points of his article (radiative transfer at top of atmosphere and discussion of ROBINSON's and DEACON's

hart). *Subject Headings:* **1. Radiation calculations 2. Carbon dioxide 3. Radiative transfer.** —*L. Kaplan.*

4.11–152 551.521.64:551.507.312.2

Dawton, D. I. and Elliot, H., **Day and night measurements of the total cosmic ray intensity at balloon altitudes.** *Journal of Atmospheric and Terrestrial Physics*, 3(4):217–222, May **1953.** 2 figs., table, 12 refs. **DWB**—Eleven day and 7 night balloon flights to 22–34 km rom Manchester, March 17–July 23, 1952, carried simple apparatus including a single counter. Counts at maximum exceeded 3000/min, with marked day-day fluctuations but no systematic difference was found between day and night. *Subject Heading:* **1. Cosmic ray observation.**—*C.E.P.B.*

4.11–153 551.521.64:577

Eugster, Jakob, **Die Erforschung der biologischen Wirkung der kosmischen Strahlung.** [The investigation of the biological effect of cosmic radiation.] *Naturwissenschaftliche Rundschau*, 6(7):281–283, July **1953.** table, 15 refs. **DWB**—The effects of cosmic radiation n shortening life and in causing mutations, and the possibility of controlled experiments, are liscussed. Experiments with *Artemia* eggs show two types of effects, one harmless, even helpul in life processes, and the other harmful to cells, especially at great heights, due to heavy particles which cause tumors and to ionization chemical effects. *Subject Heading:* **1. Cosmic ay effects.**—*C.E.P.B.*

4.11–154 551.521.64

George, E. P., **Cosmic radiation.** *Science News*, 27:30–45, **1953.** 2 figs., table. **DWB**—A lucid account of the primary ("cosmic") and secondary ("nuclear") radiation in the atmosphere. Measurement techniques, chemical analysis and energy spectrum of primary particles nd their distribution in time and space are described including relations to sunspots and nagnetic storms. Theories of origin are discussed and effect of cosmic radiation in estimates f age of the earth considered. *Subject Heading:* **1. Cosmic radiation.**—*C.E.P.B.*

4.11–155 551.521.64

Pullar, J. D. and Dymond, E. G., **The penetrating component of cosmic radiation in the pper atmosphere.** *Philosophical Magazine, 7 Ser.*, 44(353):565–577, June **1953.** 4 figs., able, 25 refs. **DWB**—The vertical intensity of the hard component of cosmic radiation at Edinburgh was measured by 3 counters separated by 2 layers of 4 cm lead, carried on balloons o average height of 17 g/cm² and one reaching 4 g/cm². The intensity increased with height o upper limits. Primary particle flux capable of penetrating 90 g/cm² Pb was 0.164/cm²/ec/ster. Primaries responsible for penetrating showers are absorbed by 120 g/cm² air. *Subject Heading:* **1. Cosmic ray measurement.**—*C.E.P.B.*

## AIR TEMPERATURE

*See also:* **Temp. advection measurement for aerological analysis** (Klincharev), 4.11–34; **Growth and decline of anticyclones** (Verderman), 4.11–126; **Thermal tides in atmos.** (Spar), 4.11–176; **Air temp., Austria, 1901–1950** (Austria, Hydrographic Bureau), 4.11–244; **Normal dexterity and tactile sensitivity in cold** (Bartlett, Grunow), 4.11–258.

4.11–156 551.524:551.501.45

Nishiuchi, H. (*Naniwa Univ.*), **A method of the estimation of the mean air temperature t the stand where there is no meteorological observation (geographical proportional method).** *Journal of Agricultural Meteorology*, Tokyo, 6(3/4):133–134, Aug. **1951.** 2 figs., 2 tables, refs. In Japanese, English summary p. 134. **DWB**—The mean air temperature of a place here no meteorological observation has been made, can be estimated by a geographical roportional method from known data of 3 adequate points surrounding the place. It is ssumed that the rise in temperature is 0.6°C per 100 m height. As examples, estimates made or Kyoto, Kiev and Cincinnati are compared with observed values. *Subject Heading:* **1. Temerature estimation.**—*Author's abstract.*

4.11–157 551.524.1:551.551

Painting, W. B., **Remarkable changes in the screen temperature at Waddington.** *Meteorological Magazine*, London, 82(972):185–188, June **1953.** 2 figs., **MH-BH**—On Dec. 5–6, 1952, there were several abrupt changes of temperature, up to 13°F in 2 hours at Waddington airfield above Lincoln Edge, a steep slope 200 ft above valley, due to onset and cessation of turbulence associated with changes of wind direction. *Subject Headings:* **1. Temperature microvariations 2. Atmospheric turbulence.**—*C.E.P.B.*

4.11–158 551.524.2

Murakami, M., **Thermal anomalies in Yamagata Prefecture.** *Journal of Meteorological Research*, Tokyo, 4(5):223–229, Aug. **1952.** 4 figs., table. In Japanese, English summary p. (16). **MH-BH**—In this paper the difference between the mean temperature of local stations in Yamagata prefecture and the normal temperature after Ono-Nishimura's formula, $t=t_o-\alpha h-\beta(\phi-35)+\gamma(\lambda-135)$, is given, where $h$ denotes the height above sea level, $\phi$ the latitude, $\lambda$ the longitude, and $\alpha$, $\beta$, $\gamma$ are constants. The monthly and annual anomalies are illustrated. These values are suitable to represent the climatic localities. *Subject Headings:* **1. Temperature anomalies 2. Yamagata Perfecture, Japan.**—*Author's abstract.*

4.11–159 551.524.3:550.34

Dué Rojo, Antonio and Gimeno Riutort, Antonio, **El factor térmico en la genesis de los microsismos.** [The thermal factor in the origin of microseisms.] *Granada. Observatorio de Cartuja, Trabajos Geofisicos, Ser. B*, 4(31), **1950.** 15 p. 6 graphs, refs. Also in: *Revista de Geofísica*, Madrid, 9(36), Oct./Dec. **1950. DWB**—The relationship between the temperature and microseisms of long, medium and short periods is investigated on the basis of seismograph records obtained at Cartuja during the period 1946–1949. The properties of mean and long period microseism are closely related to local temperature conditions; short period microseisms are associated with the presence of cold fronts. *Subject Headings:* **1. Microseisms 2. Temperature effects 3. Granada, Spain.**—*I.L.D.*

4.11–160 551.524.3(52):551.542.1(4) 551.524.34:634.23(52)

Yamamoto, T. (*Yamaguchi Univ.*), **On the relationship of the climate between Europe and Asia.** *Geophysical Magazine*, Tokyo, 23(4):475–486, May **1952.** 11 figs., 5 tables. **MH-BH**—The pressure deviations from normal in Europe at 17 stations from north and south were determined during Dec.–Feb. when the air temperature was above normal and below normal in Japan. The cold season air temperature in Japan changes year to year parallel to the winter pressure difference between Milan and Haparanda. The physical basis of this relationship is investigated by a study of the correlation coefficients of $\Delta P_{M-H}$ with air temperature and pressure in various localities in Asia and Europe. The significance of the various values of the correlation coefficients is interpreted in terms of the circulation patterns. Correlation coefficients are established between winter air temperature in Japan and $\Delta P_{M-H}$ and they indicate that the winter air temperature in Japan is governed mainly by cold air currents of Arctic origin. Deviations of mean fall bloom date of cherry trees in Japan for every century from the present normal were calculated. Since negative correlation coefficient was found between full bloom date and Feb.–March temperature of Kashiwabara, it is concluded that the 9th, 10th and 15th centuries were warm periods in Japan just as is indicated by the historical records of Europe. *Subject Headings:* **1. Pressure-temperature correlations 2. Temperature trends 3. Phenology 4. Japan.**—*I.L.D.*

4.11–161 551.524.35:551.577.59

Krames, Karl (*Lingen, Germany*), **Nordhemispherische Niederschlags- und Temperaturschaukeln.** [Northern Hemispheric precipitation and temperature fluctuations.] *Geofisica Pura e Applicata*, 23:130–136, **1952.** 3 figs., table, 4 refs. English summary, p. 130. **MH-BH**—Author made a systematic correlation analysis between contemporary temperature and precipitation anomalies for the Northern Hemisphere and selected regions of the Southern Hemisphere (Amazon region, East Africa, India). Maps show definite continental and seasonal influences. A list of correlation coefficients gives regions connected with each other in regard to temperature and precipitation variations. For example a positive temperature

variation ($r=0.73$) exists between the regions eastwards and westwards from the Rocky Mountains and a negative correlation for precipitation ($r=-0.10$). Author makes an attempt to give a physical explanation for connected variations (convective and advective rainfall, contrary thermic effect of cyclonic disturbances, etc.). *Subject Headings:* **1. Temperature-precipitation correlations 2. Northern Hemisphere 3. South America 4. India. 5. East Africa.**—*A.A.*

4.11–162 551.524.4:551.584

Laĭkhtman, D. L., **Predvychislenie sutochnykh kolebaniĭ temperatury v prizemnom sloe atmosfery.** [Calculation of daily temperature variations in the air layer near the ground.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 22(84):5–14, **1950.** fig., 3 tables, 9 refs., 42 eqs. **DLC**—The author presents a method for calculating actual temperatures in the air layer above the ground. The problem is formulated in such a way that the temperature can be determined directly, given initial and limiting conditions, and the equations are set up in such a way that they can be solved by the method of successive approximations. It is then possible to determine the effect of advection and temporal change on the coefficient of turbulence. *Subject Headings:* **1. Temperature microvariations 2. Temperature calculations 3. Low level turbulence.**—*I.L.D.*

4.11–163 551.524.4:551.584.42

Rudnev, G. V., **O temperaturnom rezhime prizemnogo sloia vozdukha.** [Temperature regime of the air layer near the ground.] *Meteorologiia i Gidrologiia*, No. 8:30–33, Aug. **1952.** 4 figs. **DLC**—Report on microclimatological observations carried out during the summer of 1941 at Alma-Ata Geophysical Observatory for the study of the vertical distribution of air temperature near the ground in the morning hours. Thermometers protected from sun and soil radiation by paper discs were installed in field crop at heights from 2 cm up to 2 m. The author found some differences from analogous investigations made by R. GEIGER, which apparently can be explained by specific conditions of GEIGER's observations, made in a Munich garden where the medium was not similar to natural field conditions. *Subject Headings:* **1. Microclimatology 2. Vertical temperature gradient 3. Alma-Ata, U.S.S.R.**—*N.T.Z.*

4.11–164 551.524.7:551.510.534

Johnson, Francis S. (*U. S. Naval Research Lab., Wash., D. C.*), **High-altitude diurnal temperature changes due to ozone absorption.** *American Meteorological Society, Bulletin*, 34(3):106–110, March **1953.** 5 figs., 14 refs. **MH-BH**—The heating effect due to absorption of solar energy by atmospheric ozone was calculated from direct measurements of ozone concentrations and of the ultraviolet spectral intensity of sunlight made during a rocket flight over New Mexico on June 14, 1949. Assuming a constant rate of heat loss throughout the day and night due to infrared emission, and no temperature change from day to day, the diurnal temperature change was found to have maximum value of 5.3°C at 48 km, falling to 1°C at 31 km and 70 km. *Subject Headings:* **1. Temperature of the stratosphere 2. Ozone absorption 3. Rocket data 4. New Mexico.**—*Author's abstract.*

## SOIL TEMPERATURE

*See also:* **Snow, Ice, Permafrost bibliog.** (SIPRE), 4.11–13; **Ground and water temp. in percolating paddy field** (Yabuki) 4.11–237.

4.11–165 551.525

*Yakuwa, R., **Über die Bodentemperaturen in den verschiedenen Bodenarten in Hokkaido.** [On earth temperatures in the different soil types of Hokkaido.] *Geophysical Magazine*, Tokyo, 14(1):1–12, March **1946.** 5 tables, 3 figs., 9 eqs. **DWB**—During the summers of 1927, 28 and 29 the author made simultaneous readings of soil and air temperatures at Sapporo in Hokkaido. The soil temperature readings were made at depths of 0, 5, 10, 20, 30 and 40 cm in sand, volcanic ash, moor, loam and clay soils. Separate tables are given for each type for each hour of the 24. The moor soils showed the least daily range, the sand the greatest. The diurnal variation was subjected to harmonic analysis and the formulas

presented for this and other relationships (conductivity, time of minimum, etc.). *Subject Headings:* **1. Soil temperatures 2. Soil types 3. Hokkaido, Japan.** —*M.R.*

4.11–166 551.525.2:631.43

Aderikhin, P. G., **Ob uteplenii pochv putem izmeneniia ikh tsveta.** [Warming of soil by changing its color.] *Meteorologiia i Gidrologiia*, No. 8:28–30, Aug. **1952.** 2 tables, 3 refs. **DLC**—Report on experiments made during 1948–1951 in Murmansk and Moscow provinces, where the comparative observations of air and soil temperatures were carried out for soils in their natural color, and for soils the surface of which was colored in black and white. The most intensive warming up of soil and deeper heat penetration during clear and cloudy days were observed for black soil surfaces. At a height of 50 cm above the black soil surface on windless days the air temperature was 3°–5°C higher than that over the white soil, and 2°–3°C higher then that over white-gray soil. These differences are increased by low soil moisture. *Subject Headings:* **1. Soil temperatures 2. Color influence on temperatures 3. Microclimatology.**—*N.T.Z.*

4.11–167 551.525.5:551.578.46

Crawford, C. B., **Soil temperatures and frost penetration.** *Canadian Soil Mechanics Conference, 5th, Ottawa, Jan. 10–11,* **1952,** *Proceedings*, p. 47–50. **DWB**—Investigations on frost penetration conducted during the last three years by the Div. of Building Research, National Research Council, Canada, are reported. Measurements were made in sand and clay test pits, under streets and at locations of frozen water mains in Ottawa (these latter were recorded by the Water Works Dept.). Data on the effect of some of the variables were collected. It was found that "frost penetration is reduced by approximately 2 feet for each foot of loose disturbed snow." Some other projects investigating frost penetration are mentioned. *Subject Headings:* **1. Frost penetration in soil 2. Snow cover influences 3. Ottawa, Canada.**—*G.T.*

4.11–168 551.525.5:631.48

†*U. S. Corps of Engineers. Frost Effects Laboratory, **Investigation of description, classification and strength properties of frozen soils, fiscal year 1951.** *U. S. Snow, Ice and Permafrost Research Establishment, SIPRE Report*, No. 8, June **1952.** 2 v. v. 1, **Report of investigations with Appendix A, Methods of describing and classifying frozen soils.** 100 plates (many fold.), 5 tables, bibliog. p. 84–88. v. 2, **Appendix B, Investigational data.** 153 plates, 17 tables. **DWB**—Comprehensive experimental study. Review of previous investigations based exclusively on available Russian papers. Ten types of soil tested ranging from sandy gravels to silt and dry soils. Laboratory tests include temporary strength of frozen soils and pure ice, tension and shear, plastic deformation, modules of elasticity, properties of crystals, effect of loading on the strength and temperature effects. Report gives a detailed description of test equipment and procedure (diagrams, photos of soil samples, etc.). Numerous data and graphs show relation of mechanical soil properties to temperature and kind of soil (compressive strength at −10°F, 4 to 9 times greater than at 31.5°F; previous investigations were extended only up to +5°F). *Subject Headings:* **1. Soil types 2. Frozen soil classification.**—*A.A.*

4.11–169 551.525.5:001

Shvetsov, P. F., **K opredeleniiu nekotorykh poniatiĭ v merzlotovedenii.** [On definition of some concepts in permafrost study.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geograf.*, No.5:83–87, **1951.** 5 refs. **MH-BH**—A discussion on terms used in permafrost science. The author suggests the following classification for the more accurate definition of frost phenomena in rock: 1) melted strata—when distilled water occurs in fluid state and the temperature of the layer is above the freezing point; 2) frosted strata—when temperature is under the freezing point but the rock contains no ice; 3) freezing strata, or freezing soil—when temperature is under freezing point and some amount of ice can be observed. The term permafrost is being applied to soil which has been frozen not less than 100 years. In other cases the terms: long period freezing; seasonal freezing and temporary freezing must be used. *Subject Headings:* **1. Permafrost 2. Definitions.**—*N.T.Z.*

### SEA TEMPERATURES

4.11–170 551.526.2:551.46

Wojnicz, Bogusław, **Badania wód Bałtyku w roku 1948.** [Studies on Baltic Sea waters in 1948.] *Poland. Panstwowy Instytut Hydrologiczno-Meteorologiczny, Wiadomosci Sluzby*, 1(2):153–172, **1950.** figs., tables. **DWB**—Results of measurements of temp., salinity, density, $O_2$ content and $P_2O_5$ content for the surface and different depths made from July to Nov. 1948 in the coastal waters of Poland are presented and discussed. *Subject Headings:* **1. Sea temperatures 2. Salinity 3. Baltic Sea 4. Poland.**—*A.A.*

4.11–171 551.526.6:639.222.2(265:57)

Probatov, A. N. and Shelegova, E. K., **K metodike predskazaniia srokov nachala neresta sel'di u zapadnogo poberezh'ia IUzhnogo Sakhalina.** [On the methods of forecasting the beginning of herring spawning on the western coast of South Sakhalin.] *Meteorologiia i Gidrologiia*, No. 5:51–53, **1952. DLC**—The water temp. observations for 16–18 years were used for investigation of relation between the time of herring spawning and the thermal state of sea. Correlation coefficient for Jan. (−0.09) showed no relation. For Feb. and March coefficients of $r = -0.64$ and $-0.62$ were found. Thus for the forecasting of probable date of herring spawning the water temp. characteristics observed in Feb. can be used. The experimental forecasts established the date of spawning for 1949 as April 5 (the actual beginning of spawning was on April 6) and for 1950 between April 12–15 (the actual beginning was on April 12). *Subject Headings:* **1. Sea temperatures 2. Herring fisheries 3. Sakhalin, U.S.S.R.**—*N.T.Z.*

## ATMOSPHERIC PRESSURE AND WIND

### PRESSURE

*See also:* **Meteorological problems of electronic surveying** (Grand), 4.11–37; **Forecasting waves** (Scorer), 4.11–76; **Growth and decline of anticyclones** (Vederman), 4.11–126; **Climate relationship, Europe—Asia** (Yamamoto), 4.11–160; **Quadruple velocity correlations and pressure in isotropic turbulence** (Uberoi), 4.11–180; **Fog rain** (Grunow), 4.11–218; **Solar activity and atmos.** (Koppe), 4.11–267.

4.11–172 551.54

Whiten, A. J. and Manley, Gordon, **World-wide distribution of pressure.** *Royal Meteorological Society, Quarterly Journal*, 79(341):419, July **1953. DWB**—Whiten questions statement by Manley that average barometric pressure over whole earth must always be the same, in view of possible changes in composition by oxidation or by increase or decrease of water vapor. Manley agrees that small changes due to these causes may possibly occur. *Subject Heading:* **1. Atmospheric pressure.**—*C.E.P.B.*

4.11–173 551.541:551.551

Clark, R. D. M., **An investigation of certain short-period atmospheric micro-oscillations.** *Journal of Meteorology*, 10(3):179–186, June **1953.** 12 figs., table, 10 refs., 13 eqs. **MH-BH**—The Macelwane electromagnetic microbarograph (1938) is described. The equation of motion of the galvanometer in relation to the period of pressure oscillation is developed and shown by curves. Three instruments were set up at Florissant, Miss. and specimen traces of 6 different intensities of random oscillations are illustrated. The frequencies of these are discussed in relation to wind speed, inversions, surface temperature and passage of fronts. The oscillations are analogous to atmospheric turbulence and a theory of their relations to meteorological elements is developed in terms of the energy available for eddying. *Subject Headings:* **1. Microbarometric oscillations 2. Eddies.**—*C.E.P.B.*

4.11–174 551.543:551.510.535

Beynon, W. J. G. and Brown, G. M.; Lewis, R. P. Waldo and McIntosh, D. H., **Geophysical and meteorological changes in the period January–April 1949.** *Nature*, 171(4361):967–969, May 30, **1953.** 3 figs., 2 tables, 8 refs. **DLC**—Beynon and Brown refer to criticisms by Lewis and McIntosh (*Nature*, 170:448, 1952) of their paper in *Nature*, 167:1012, 1951,

and from a study of *unsmoothed* data confirm their conclusion of 27-day recurrences of ground pressure and E-layer critical frequency by using the correlogram and by other statistical examination. Application of statistical methods to geophysical series is discussed. LEWIS and MCINTOSH reply, also discussing statistical methods and pointing out improbability of a physical connection between worldwide fE and pressure over a restricted area. *Subject Headings:* **1. Pressure oscillations 2. E layer.**—*C.E.P.B.*

4.11–175 551.543.1(438

Jantzen, Kaziemierz, **Przebieg roszny krótkookresnowych wahán cisnienia powitrza.** [Annual variation of short-period pressure oscillations.] *Przegląd Meteorologiczny i Gydrologiczny* No. 1/2:1–14, **1952.** 5 tables. English summary p. 13–14. **MH-BH**—The records of a large Richard barograph at Wilno during the period Jan. 12, 1934–Dec. 9, 1939 were used for this investigation. The author calculated the elements of the 24 h, 12 h, 8 h, and 6 h oscillations. It was found that the 24 hourly component is 0.14 mb, with maximum at 5 h 18 min and these oscillations show a certain annual variation. The mean amplitude of the 12-hourly component is 0.174 mb with maximum at 10 h 35 min with an error ±3 min. The amplitude of 8-hourly component is 0.036 mb, with maximum at 10 h 47 min, for the 6-hourly oscillation the amplitude was 0.13 mb with maximum at 9 h 38 min. The 8-hourly component showed an annual variation with greatest amplitude and earliest time of maximum in winter 0.100 mb at 10 h 15 min and lowest amplitude and latest maximum in summer 0.02 mb at 14 h 20 min. *Subject Headings:* **Diurnal pressure variations 2. Wilno, Poland.**—*N.T.Z.*

4.11–176 551.543.1:551.524.3

Spar, Jerome, **Thermal tides in the atmosphere.** *American Geophysical Union, Transactions*, 33(6):810–816, Dec. **1952.** 3 figs., 2 tables, 8 refs., 9 eqs. **MH-BH**—MARGULES' theory of thermally induced diurnal and semidiurnal pressure oscillations is extended to the three-dimensional atmosphere by the method of vertical integration. The numerical solutions obtained by MARGULES for the surface pressure oscillations are retained in the present theory by introducing a suitably defined atmospheric "depth." A method for calculating the surface pressure oscillation resulting from periodic heating and cooling of layers high in the atmosphere is suggested. *Subject Headings:* **1. Diurnal pressure variations 2. Diurnal temperature variations. I. Margules, M.**—*Author's abstract.*

4.11–177 551.547.

Sparks, B. W., **Effects of weather on the determination of heights by aneroid barometer in Great Britain.** *Geographical Journal*, 119(1):73–80, March **1953.** 6 figs., table, 4 refs. **DWB**—Description of the technique of surveying by aneroid. Adequate conditions are anticyclone, with wind less than 12 mi/h and not very unstable air. Effects of pressure changes fronts and unstable air masses on measured heights in SE England are illustrated. In suitable weather error need not exceed 5 ft in a traverse of 1 hr. *Subject Heading:* **1. Altimetry.**—*C.E.P.B.*

## TURBULENCE

*See also:* **Dynamics of rows of successive vortices unlimited on one side** (Cârstoin), 4.11–107; **Changes in screen temp., Waddington** (Painting), 4.11–157; **Short period atmos. oscillations** (Clark), 4.11–173; **Comparison of power law and generalized logarithmic formula in micrometeorology** (Lake), 4.11–187.

4.11–178 551.551:551.593.1

Gifford, Frank and Mikesell, A. H., **Atmospheric turbulence and the scintillation of starlight.** *Weather*, 8(7):195–197, July **1953.** fig., table, 2 refs. **MH-BH**—Scintillation observations of stars near zenith at Washington, D. C., were correlated with wind speed and shears at various heights. Scintillation was greatest at frequencies below 50 cycles/sec. Coefficients of about +.5 were found with wind speed at 30,000 ft and wind shear 18,000–20,000 ft. *Subject Headings:* **1. High level turbulence 2. Scintillation.**—*C.E.P.B.*

4.11–179 551.551:532.5

Long, Robert R., **Steady motion around a symmetrical obstacle moving along the axis of a rotating liquid.** *Journal of Meteorology*, 10(3):197–203, June **1953.** 9 figs., 19 refs., 24 eqs. **MH-BH**—A generalized solution is found, of which G. I. TAYLOR's is only a particular case. The corollaries of the solution are discussed. TAYLOR's experiment of pulling an obstacle along the axis of a rotating column of water was repeated with improvements and confirmed the theoretical deductions. *Subject Heading:* **1. Fluid dynamics.**—*C.E.P.B.*

4.11–180 551.551:551.541:519.2

Uberoi, Mahinder S. (*Johns Hopkins Univ.*), **Quadruple velocity correlations and pressure in isotropic turbulence.** *Journal of the Aeronautical Sciences*, 20(3):197–204, March **1953.** 0 figs., 2 tables, 18 refs., 24 eqs. **DLC**—It is shown that the correlation of fluctuating static pressure (in an incompressible and homogeneous turbulence) with any fluctuating quantity in the flow field can be expressed in terms of the correlation of the same quantity with two or more components of the velocity. The correlations of pressure with itself are investigated in detail for the case of isotropic turbulence. These correlations can be expressed in terms of correlations involving two velocity components at another point. A postulated relation between the fourth-order and second-order correlations is investigated. This relation is satisfied, for example, if the joint probability density of the four components of velocity is Gaussian. The consequences of this relation are compared with the measurements of the fourth-order correlations. The root mean square (r.s.m.) pressure and pressure gradients are computed from second-order correlation for a range of turbulence Reynolds Numbers. Since the pressure gradient is related to diffusion of marked particles from a source, the computed pressure gradient level is compared with that calculated from a set of diffusion measurements. *Subject Headings:* **1. Turbulence theory 2. Pressure microvariations 3. Statistical analysis.** —*Author's abstract.*

4.11–181 551.551

Wanta, R. G., **The onset of turbulence in an elevated layer near sunrise.** *Royal Meteorological Society, Quarterly Journal*, 79(341):398–402, July **1953.** 2 figs., 14 refs. **DWB**—Wind direction records at 46 and 125 m, Brookhaven, N. Y., showing smooth flow, damped eddies and turbulent flow (eddy period less than 1 min) are illustrated. Occasions of smooth and turbulent flow are plotted against differences of temperature and wind speed across the layer, and calculated Richardson numbers drawn in. The critical values of the latter are found to be probably between $\frac{1}{3}$ and $\frac{1}{2}$. *Subject Headings:* **1. Atmospheric turbulence 2. Brookhaven, N. Y.**—*C.E.P.B.*

4.11–182 551.551:551.574.1

Yeo, D. and Thompson, B. W., **Deposition of a coarse aerosol released from a low-flying aircraft.** *Nature*, London, 172(4369):168–169, July 25, **1953.** 2 figs. **DWB**—Proportion of droplets, 5–250$\mu$, released from an aircraft flying cross-wind at 30 ft, deposited in 90 sec was compared with a measure of atmospheric turbulence $F$: $F=\left\{\frac{T_{10}-T_{2.5}+\Gamma\cdot\delta h}{(u_5)^2}\right\}$; $T_{10}$, $T_{2.5}$ are air temperatures °F, $u_5$ wind ft/sec at 5 m, $\Gamma\delta h$=dry adiabatic, 2.5–10 m. Proportion varied from below 0.2 at $F=-40$ to 0.6 at $F=+80$. Proportion deposited/proportion released with various values of $F$ increased linearly with time. *Subject Headings:* **1. Aerosols 2. Atmospheric turbulence.**—*C.E.P.B.*

## WIND

4.11–183 551.553:551.556.3(899)

*Morandi, Luis, **Calmas relativas y vientos impetuosos en el clima de Montevideo.** [Relative calms and violent winds in the climate of Montevideo.] *Revista Meteorológica*, Montevideo, 1(42/43):251–283, July/Oct. **1952.** 8 tables. **MH-BH**—Wind conditions at Montevideo are analyzed with a view to the utilization of wind energy for wind-driven motors. Part one of the study contains a brief discussion and graphical representation of the general regime of winds. Data on the annual directional and frequency distribution of violent winds are pre-

sented and discussed in part two. Parts three and four deal with the annual and diurna frequency distribution of relative calms (divided into six categories of wind speeds ranging from 0 to 4.2 m/s) and with their effect on wind energy utilization. The paper is called one o the best and most recent works on the subject by the editor JOSE TISCORNIA. *Subject Headings:* **1. Wind variations 2. Wind utilization 3. Wind data 4. Montevideo, Uruguay.**—*G.T.*

4.11–184 551.553(547

Venkateswaran, S. V. (*Physical Res. Lab., Ahmedabad*), **The daily variation of wind in the lower atmosphere over Ahmedabad.** *Indian Journal of Meteorology and Geophysics* 4(1):82–86, Jan. **1953.** 5 figs., table. **MH-BH**—The lower atmospheric wind structure ove Ahmedabad has been studied from a detailed analysis of one complete years' observations It is found that the local winds introduced by the orographical peculiarities of the surrounding country are (1) the katabatic wind that comes as a northeasterly current extending to a depth of about 0.15 to 0.25 km in the months of October to January and (2) the sea breeze tha reaches from the Gulf of Cambay in the hot months just prior to and after the local monsoon A seasonal examination of the pilot balloon winds shows that the nature of the diurnal variation of wind is governed mainly by the amount of turbulence in the frictional layer. This variation is confined to about 3000 ft in winter and extends to a greater height in summer. It is also shown how, in the winter months, both the wind and temperature distributions help in the formation of a very stable layer just above 3000 ft limiting the upper reach of surface turbulence *Subject Headings:* **1. Local winds 2. Diurnal wind variations 3. Turbulence in the frictional layer 4. Ahmedabad, India.**—*Author's abstract.*

4.11–185 551.553.8:551.515.

*Douglas, C. K. M., **Gale of December 17, 1952.** *Meteorological Magazine*, London 82(969):71–74, March **1953.** 3 figs. **MH-BH**—Very severe gale over Scotland and N England, due to a complex depression moving SE, gave a squall of 96 kt at Cranwell, with pressure rise of 1.5 mb and 0.8 mm rain. *Subject Headings:* **1. Gales 2. Squalls 3. Depressions.**—*C.E.P.B.*

4.11–186 551.55

Deacon, E. L. and Panofsky, Hans Arnold, **Wind profiles and the shearing stress.** *Royal Meteorological Society, Quarterly Journal*, 79(339):164–167, Jan. **1953.** 3 tables, 6 refs., 2 eqs **DWB**—Criticism by DEACON of note by PANOFSKY (*R. Met. Soc., Quarterly Journal*, 78:411–414, July 1952) and reply by PANOFSKY. *Subject Heading:* **1. Wind profiles.**—*C.E.P.B.*

4.11–187 551.554:551.55

Lake, Herman, **A comparison of the power law and a generalized logarithmic formula in micrometeorology.** *American Geophysical Union, Transactions*, Pt. 1, 33(5):661–668, Oct **1952.** 6 figs., 5 refs., 12 eqs. **MH-BH**—Extension of the logarithmic law to nonadiabati stratification is too cumbersome, and the result of later research to represent the variation of wind in the vertical as a power function of height works satisfactorily when the exponent i determined by thermal stratification. But since the principal disadvantages of this power law lie in the height and time variation of the exponent, it is considered no better than a interpolation formula. Author introduces an analytical equation for the power as a function of the defined parameters of turbulent air flow in the surface layer, and demonstrates a analytical expression of the vertical distribution of wind velocity near the earth's surface *Subject Headings:* **1. Wind profiles 2. Wind structure.**—*W.N.*

## WIND EFFECTS

4.11–188 551.556:532.593:551.46

Arakawa, H. and Suda, K. (*Met. Res. Inst. & Hydrographic Dept., Tokyo*), **Analysis o winds, wind waves and swell over the sea to the east of Japan during the typhoon of Septembe 26, 1935.** *Monthly Weather Review*, 81(2):31–37, Feb. **1953.** 6 figs., 8 tables, 8 refs. **MH-BH** —An analysis of winds, wind waves, and swell over the sea to the east of Japan during th historical typhoon of September 26, 1935, is given. Occurrence of the storm and its movemen

across a main squadron of the Imperial Japanese Fleet which was then conducting grand maneuvers provided what may be the best coverage on record of surface winds, wind waves, and swell within 200 nautical miles of a typhoon center in its mature stage, and furnished an unequaled set of data for studying the relation between the meteorological and oceanographical elements over the ocean during a period of hurricane winds. *Subject Headings:* **1. Wind waves 2. Swell 3. Typhoons 4. Northwest Pacific.**—*Authors' abstract.*

4.11–189 551.556:532.593

Johnson, Joe William and Rice, E. K. (*Univ. of California*), **A laboratory investigation of wind-generated waves.** *American Geophysical Union, Transactions*, 33(6):845–854, Dec. 1952. 7 figs., 3 tables, 16 refs. **MH-BH**—Waves were generated by forcing wind through a covered laboratory flume. For steady-state conditions, measurements by means of an oscillograph were made of the wave characteristics at various points in the flume. The significant heights and periods were determined and related to the fetch and wind speed. The height and period of the individual waves for various fetch lengths were compared by means of joint frequency diagrams. The orbital motions of particles throughout the water depth were determined from motion pictures. Particle velocities below the crest are compared with theoretical relationships. Some information on wind set-up and shear-stress coefficients is presented. *Subject Heading:* **1. Wind waves.**—*Authors' abstract.*

4.11–190 551.556:551.579.4(438)

Wierzbicki, Jan, **Wpływ wiatru na zmiany stanu wód śródlądowich.** [The wind influence upon the level of inland water.] *Przegląd Meteorologiczny i Hydrologiczny*, 1950/1951:181–201, 1951. eqs. **DWB**—Comparison of different water levels in Polish reservoirs, lakes, etc. due to the effect of wind velocity. Numerous equations and formulas for their computation compared with TILZEN's theories. *Subject Headings:* **1. Wind effects 2. Water level variations 3. Poland.**—*W. Tomczykowski.*

4.11–191 551.556.3:6

Vinter, A. V., **Ispol'zovanie energii vetra.** [Utilization of wind energy.] *Priroda*, Moscow, No. 2:23–28, Feb. 1953. illus., ref. **DLC**—General considerations of the possibility and necessity of utilizing wind energy in line with other sources of energy supplying industry, transportation and agriculture with power are presented and discussed. Proceeding from the principle that "wind energy must be directed to the elimination of the harmful effect of the wind itself"—the author presents approximate calculations giving a general picture of the scale of potential utilization of wind-driven generators in newly irrigated areas, as well as the Arctic region, where atmospheric and climatic conditions are unfavorable for the construction of extended power transmission lines. *Subject Headings:* **1. Industrial meteorology 2. Wind utilization 3. Wind power projects 4. U.S.S.R.**—*A.M.P.*

## UPPER AIR WINDS AND VERTICAL MOTION

*See also:* **Convection in atmos.** (Ludlam, Scorer), 4.11–2; **Forecasting waves** (Scorer), 4.11–76; **Air motion in upper atmos.** (Scorer), 4.11–93; **Determination of wind velocities in ionosphere** (Briggs, Phillips), 4.11–100; **Travelling disturbances in ionosphere** (Price), 4.11–104; **Westerly troughs, Japan** (Ooi), 4.11–116.

4.11–192 551.557:551.510.52/3

Gold, E., **The variation of wind near the tropopause.** *Meteorological Magazine*, London, 82(973):194–198, July 1953. ref., 3 eqs. **MH-BH**—Occurrence of max. wind 30–40 mb below tropopause indicates that thermal wind is reversed at that level. Variation of wind near tropopause is related to slope of the latter and to temperature lapse. It is evaluated for lapse rate at tropopause: inversion, decrease of lapse rate, change of lapse rate to zero below tropopause, and lapse rate changing towards higher pressure. *Subject Headings:* **1. Upper air winds 2. Tropopause.**—*C.E.P.B.*

4.11–193 551.557:551.513.2

Johnson, D. H., **A further study of the upper westerlies; the structure of the wind field in the eastern North Atlantic and western Europe in January 1950.** *Royal Meteorological Society, Quarterly Journal*, 79(341):402–407, July 1953. 7 figs., table, 7 refs. Also: *Great Britain. Meteorological Research Committee, M.R.P.* 761, 1952. **DWB**—Daily cross sections Angmagsalik-Tunis and Lagens-Copenhagen in a month of mixed weather all showed maxima of jet stream type near tropopause (most frequently in 275–325 mb). Daily positions are plotted. Velocity profiles centered on jet axis are shown for jets tending to move towards warmer and towards colder troposphere. Mean Jan. and winter sections Angmagsalik-Tunis are discussed. *Subject Headings:* **1. Upper air winds 2. Jet stream.**—*C.E.P.B.*

4.11–194 551.557.2(51,59)

Hay, R. F. M., **High-level strong easterlies over Singapore and Hong-Kong.** *Weather*, 8(7):206–208, July 1953. 2 tables, ref. **MH-BH**—Tables give mean vector winds over Singapore 1950–52 up to 65,000 ft and Hong Kong 1950–51 up to 60 mb with discussion. *Subject Headings:* **1. Upper air winds 2. Singapore 3. Hong Kong.**—*C.E.P.B.*

4.11–195 551.558.1:551.511

Bunker, Andrew F., **Diffusion, entrainment and frictional drag associated with non-saturated buoyant air parcels rising through a turbulent air mass.** *Journal of Meteorology*, 10(3):212–218, June 1953. 4 figs., 4 tables, 4 refs., 14 eqs. **MH-BH**—The equations of H. G. Houghton and H. E. Cramer for entrainment of air into jets are extended to buoyant air parcels rising through a turbulent ground layer. Small size, small temperature difference and intense turbulence lead to rapid dissipation, severe conditions to survival from bottom to top. Observations in upper-adiabatic gradients at Brookhaven, N. Y., at 25–100 m and by airplane 100–1200 m on various days confirm the theoretical results. The coefficient of pressure drag of one air parcel was found to be 0.1. *Subject Headings:* **1. Entrainment 2. Convection.**—*C.E.P.B.*

4.11–196 551.558.1:551.576.11

Scorer, R. S., **The spreading out of downdraughts.** *Weather*, 8(7):198–201, July 1953. 3 figs. **MH-BH**—Growth and decay of a CuNb cloud is illustrated. With rain, a downdraft of cold air occurs which may reach the ground and become a shallow katabatic wind. Two cases from Guadarrama Mts. near Madrid are described with hygrograms and thermograms and glider experiences recounted. *Subject Headings:* **1. Cumulonimbus clouds 2. Downdrafts.**—*C.E.P.B*

## AQUEOUS VAPOR AND HYDROMETEORS

### EVAPORATION

*See also:* **50-year observation with Wild evaporimeter** (Antonik, Branicki), **4.11–45.**

4.11–197 551.573:551.579.5:631.548

Alpat'ev, A. M., **Ispariaemost' kak priblizhennyĭ pokazatel' potrebnosti sel'skokhziaĭstvennykh kul'tur v vode.** [Evaporability as an approximate indicator of water requirements of growing crops.] *Meteorologiia i Gidrologiia*, No. 5:41–47, 1952. 7 tables, 14 refs. **DLC**—Report on experiments made in many points of the U.S.S.R. during the last years. Field investigations of relation between productivity and optimal moisture of soil showed the lowest boundary of optimal soil moisture for clayey soil about 70–80%; for sandy loam soil 50%, and still lower for sandy soils. The stable relationship between evaporation (determined as transpiration and soil evaporation) and evaporability for annual plants in various climatic regions is 0.80–0.97. That indicates the climatic ability to limit the water consumption by plants. The different states of plants cannot noticeably change the water consumption. Many other experiments, made in arid and humid regions, indicate a good possibility to determine the water requirement by calculation of evaporability from usual climatic data.

*Subject Headings:* **1. Evapotranspiration 2. Agricultural meteorology 3. Soil moisture.**—*V.T.Z.*

4.11–198 551.573:6

Dale, Ivan R. (*Forest Dept. of Uganda*), **Is East Africa drying up?** *East African Agricultural Journal*, Nairobi, 17(3):116–118, Jan. **1952. DLC**—Many different types of evidence geological, limnological, ecological, etc.) are cited to show the variations in wetness or dryness of East Africa during the postglacial era. An attempt is made to fit a 640 year cycle to rainfall conditions, making the first half of the 19th century the driest part of this millenium. The conclusion is that in general East Africa is not drying up, but in certain spots desiccation is increasing due to man-made conditions (land misuse, overstocking, deforestation or overpopulation). *Subject Headings:* **1. Desiccation 2. Rainfall cycles 3. East Africa.**—*M.R.*

4.11–199 551.573:551.48

Stam, A. H. (*Rijkswaterstaat, 's-Gravenhage*), **Het Verdampingsonderzoek in de Rottegatspolder.** [Evaporation research in the Rottegatspolder.] (In: Nederlandse Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek. Commissie vor Hydrologischen Onderzoek, **Verslagen Technische Bijeenkomsten, 1–6, 1946–1950.** 's-Gravenhage, **1952.** p. 13–17. In Dutch; English, French summaries, p. 279, 307.) **DWB**—General discussion. Research to be done on vertical vapor transport, energy balance of soil surface, water balance of polder and on experimental plots under various crops. *Subject Headings:* **1. Evaporation 2. Rottegatspolder, Netherlands.**—*A.A.*

## CLOUD PHYSICS

*See also:* **Critical rime studies** (Grunow), 4.11–8; **Drop size distribution in aerosols** (Gendron), 4.11–26; **Wind influence on inland water level** (Wierzbicki), 4.11–190; **Modified form of Trabert's formula** (Best), 4.11–268; **Dependence on angle of light scattering of single fog droplets** (Elsaesser, Wirtz), 4.11–270.

4.11–200 551.574.1

Colloquium on Microwave Meteorology, Aerosols and Cloud Physics, McGill University, Sept. 1950, **Proceedings.** Ralph J. Donaldson, Jr. (*ed.*). *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 13, May **1952.** 123 p. 32 figs., refs. **DWB**—The purpose of the colloquium held at Montreal, Canada, on Sept. 18 and 19, 1950 under the auspices of U. S. Air Force Cambridge Research Center, was to assemble the various groups conducting research on the physics of clouds and precipitation under sponsorship of the Research Center and also to sum up present knowledge of several aspects of cloud physics, especially the growth and distribution of water droplets. The proceedings contain illustrated text of lectures and discussions. The individual papers will be dealt with separately. *Subject Headings:* **1. Cloud physics 2. Symposia. I. U. S. Air Force. Cambridge Research Center I. Donaldson, Ralph J., Jr.** (*ed.*).—*G.T.*

4.11–201 551.574.1

La Mer, Victor K. (*Columbia Univ., N. Y.*), **A note on deposition of aerosols.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 13:73–76, May **1952.** fig., 5 refs. Discussion p. 75–76. **DWB**—The author briefly describes an experiment which consisted in exposing mosquitoes in a wind tunnel to insecticide aerosols of different particle size, carried by air currents of varying velocity. As a result of an analysis of the experimental data a relationship is established between particle diameter, wind velocity and rate of deposition. This latter value is determined by the number of mosquitoes killed. *Subject Headings:* **1. Aerosol deposition 2. Wind tunnel experiments. I. Colloquium on Microwave Meteorology, Aerosols and Cloud Physics.**—*G.T.*

4.11–202 551.574.1

La Mer, Victor K. (*Columbia Univ., N. Y.*), **Generation of aerosols.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 13:32–39, May **1952.** fig.,

5 refs. Discussion p. 37–39. **DWB**—A spark-discharge generator producing monodisperse particle size aerosols for cloud chamber investigations is described and its schematic diagram presented. The generator produces particles of about 0.1 to about 1$\mu$ radius, and a radius up to 10$\mu$ can be achieved by introducing some modifications. Theories of droplet growth by diffusion and of "equilibrium growth" are summed up. *Subject Headings:* **1. Drop growth 2. Drop diffusion 3. Cloud chambers. I. Colloquium on Microwave Meteorology, Aerosols and Cloud Physics.**—*G.T.*

4.11–203 551.574.

McDonald, James E.; Woodcock, A. H., **Remarks on "Atmospheric salt particles and raindrops."** *Journal of Meteorology*, 10(2):165–166, April **1953.** ref. **MH-BH**—(*See item* 3.11–184, Nov. 1952, *MAB.*) McDonald questions Woodcock's hypothesis that large salt particles grow to raindrop size by condensation and coalescence. Woodcock replies. *Subject Headings:* **1. Saline nuclei 2. Condensation nuclei 3. Raindrops.**—*C.E.P.B.*

4.11–204 551.574.1:551.577.11:551.508.8

McGill University. Macdonald Physics Laboratory, **Stormy weather research group.** Contract AF 19(122)-217, Progress Report No. 3, Oct. 1–Dec. 31, **1950.** 7 p. graph. **DWB**—Brief general information on the project's progress in investigating cloud and precipitation physics and dynamics and the properties of clouds and precipitation from radar data. Special attention is given to noise texture of microwave echoes, particle-size distribution, intensity of continuous precipitation, scattering from inhomogenous particles and an analysis of Ottawa snow data. *Subject Headings:* **1. Cloud physics research 2. Precipitation physics 3. Radar meteorology. I. Marshall, J. S. II. Contract AF 19(122)-217.**—*G.T.*

4.11–205 551.574.1:551.577.11:551.508.8

McGill University. Macdonald Physics Laboratory. Stormy Weather Res. Group. **Theoretical investigation of cloud and precipitation physics and dynamics, and the properties of clouds and precipitation, as determined from the analysis of data provided by radar probing of storms.** Contract AF 19(122)-217, Progress Report No. 5, June 30, **1951.** 7 p. graph. **DWB**—Brief descriptions of progress on the following projects are given: (1) noise texture of microwave echoes from cloud and precipitation; (2) effect of coalescence between raindrops on size distribution; (3) the intensity of continuous precipitation; (4) microwave scattering from concentric spheres of different refractive indexes; (5) review of cloud and precipitation studies by microwaves. *Subject Headings:* **1. Cloud physics research 2. Precipitation physics 3. Radar meteorology. I. Contract AF 19(122)-217.**—*I.L.D.*

4.11–206 551.574.1:551.576.1

Weickmann, H. K. and aufm Kampe, H. J., **Physical properties of cumulus clouds.** *Journal of Meteorology*, 10(3):204–211, June **1953.** 10 figs., table, 7 refs. **MH-BH**—The technique of collecting cloud droplets in castor oil on slides is described. Slides were exposed at different heights above cloud base in New Jersey and Florida, and immediately microphotographed; records of visibility in the cloud were also made. Average droplet radius spectra and visibility curves are given for different levels in fair weather Cu (narrow spectrum), cumulus congestus and CuNb (both very broad with radius up to 100$\mu$). The droplet concentration decreases with height above base; visibility is least 2000 m above base. The mechanism of coalescence is discussed. *Subject Headings:* **1. Cloud physics research 2. Cumulus clouds.**—*C.E.P.B.*

## DEW AND ICING

4.11–207 551.574.41:63

Steubing, Lore, **Der Tau und seine Bedeutung für die Pflanze.** [Dew and its importance for plants.] *Umschau*, 53(15):456–457, Aug. 1, **1953.** 2 figs., 4 tables, 5 refs. **DWB**—Dew, forming 5–15% of total precipitation in Germany, varies greatly with location, a meadow having 100 times as much as mid forest. It is greatest on ground protected by hedges and on loose soil. Dew deposits on different parts of a tree are shown. It is important for plant

development, lessening transpiration, aiding green growth and minimizing effect of drought. *Subject Headings:* **1. Dew 2. Agronomy.**—*C.E.P.B.*

4.11–208 551.574.42:621.315.175

Shealy, A. N., Althouse, K. L. and Youtz, R. N., **Forty-two years' experience combating sleet accumulation.** *Electrical Engineering*, N. Y., 72(2):131, Feb. **1953.** 2 figs. **DWB**—(*See also item* 3J–71, Oct. 1952, *MAB*.) Results of 42 years' experience in sleet reporting and removal from power lines of Pennsylvania Water and Power Co. in the Baltimore-Lancaster area, described. Ordinary weather reports and observations on their own and connecting power systems are used in sleet warning and forecasting. Electrically heated lines were built in 1910, 1914, 1925 and have proven that if heating is begun without delay, trouble from sleet can be eliminated. Wind and temperature conditions must be considered in determining the amount of heat necessary. *Subject Headings:* **1. Industrial meteorology 2. Icing of transmission lines 3. Icing prevention 4. Maryland.**—*M.R.*

4.11–209 551.574.7:551.508.822

Ishii, Y., **On the experiment on icing on the code type radiosonde.** *Tateno, Japan, Aerological Observatory, Journal*, 5(1):93, March **1951. DWB**—Abstract of paper, presented at meeting. Icing may occur on bimetal thermometer and hair hygrometer of ascending radiosonde but can be prevented by setting two plates in front of bimetal. Icing then occurs on the plates themselves. *Subject Headings:* **1. Icing of radiosondes 2. Radiosonde errors.**—*A.A.*

## FOG

*See also:* **Fog Investigation Dispersal Operation, 4.11–82; Artificial fog dispersal** (Harrison), **4.11–83.**

4.11–210 551.575(52)

Koenuma, K., **On the sea fog in the neighbouring seas of Japan.** *Journal of Meteorological Research*, Tokyo, v. 4, Suppl. Number, p. 1–24, March **1952.** 7 figs., 11 tables, 19 refs. In Japanese, English summary p. 321. **MH-BH**—Annual number of fog days, foggiest month and annual variation are tabulated for different districts (in Japanese characters only) and related to wind direction, air and water temperature, air mass and vertical variation of temperature and humidity in lowest 3 km. Three kinds of sea fog are identified: 1) formed in spring and early summer by radiative cooling of cool humid maritime air around N. Japan; 2) formed in mid-summer by cooling of Tm air blowing over cold ocean currents; 3) in cyclone season by adiabatic expansion of inflowing air. *Subject Headings:* **1. Fog distribution 2. Fog formation 3. Japan.**—*C.E.P.B.*

4.11–211 551.575.1:551.588.7

Fukutomi, T., **A theoretical study on the changes of liquid water contents of the intruding stationary sea fogs due to the capturing action of leaves and branches of the woods in the coastal region.** *Journal of Meteorological Research*, Tokyo, v. 4, Suppl. Number, p. 151–165, March **1952.** 8 figs., 7 refs., eqs. In Japanese, English summary p. 330–331. **MH-BH**—With certain assumptions as to wind structure and eddy diffusion, the change of water content in fogs of different depths, passing through forests of different widths is calculated. The plotted curves are shown to agree well with results of observations. *Subject Headings:* **1. Fog dissipation 2. Forest influences.**—*C.E.P.B.*

4.11–212 551.575.1:551.588.7

Hori, J., **On the combined effect of falling drop, temperature, diffusion upon fog reduction.** *Journal of Meteorological Research*, Tokyo, v. 4, Suppl. Number, p. 167–173, March **1952.** 3 figs., 22 eqs. In Japanese, English summary p. 331. **MH-BH**—The discussion by K. Imahori (*see item* 4.8–176, Aug. 1953, *MAB*) is extended to include second order effects. It is shown that gravity causes large changes in temperature gradient but its effect on distribution of fog water content is negligible apart from falling drops. *Subject Headings:* **1. Fog dissipation 2. Forest influences 3. Japan.**—*C.E.P.B.*

## CLOUDS

*See also:* **Convection in atmos.** (Ludlam, Scorer), 4.11–2; **Spreading of downdrafts** (Scorer), 4.11–196; **Physical properties of Cu clouds** (Weickmann, aufm Kampe), 4.11–206; **Modified form of Trabert's formula** (Best), 4.11–265.

4.11–213 551.576.11

Langwell, Patricia A., **A mechanism for convection over the ocean.** *Journal of Meteorology*, 10(3):187–190, June **1953.** 2 refs., 32 eqs. **MH-BH**—Clouds north of Puerto Rico are mostly Cu but ocean is effectively an isothermal surface and no "thermals" were found. There is an inversion around 600 m, which is about 85% of lifting condensation level, and it is shown mathematically that clouds can form where oscillations enable the lower moist layer to break through the inversion. The calculated wave length of the unstable oscillation and hence the cloud diameter is 2 km. *Subject Headings:* **1. Cumulus cloud formation 2. West Indies.**—*C.E.P.B.*

4.11–214 551.576.36:551.43(42)

Glasspoole, J., **Frequency of cloud at mountain summits.** *Meteorological Magazine* London, 82(971):156–157, May **1953.** 3 tables, 2 refs. **MH-BH**—Diurnal and annual variation of frequency with which Great Dun Fell, Cumberland (2780 ft) and Lowther Hill, Dumfries (2377 ft) are in cloud are tabulated. Greatest frequency night, winter; least 15 h summer. Places round Ben Nevis (2306–4406 ft) in winter show frequency increasing with height from 20 to 67%. *Subject Headings:* **1. Cloud frequencies 2. Mountain meteorology**—*C.E.P.B.*

## PRECIPITATION

*See also:* **Precip. distribution, Hardanger** (Godske), 4.11–7; **Rainfall regime, Argentina** (Marchetti), 4.11–11; **Comparability of rainfall before 1935 for Saxony with neighboring regions** (Pelzl, Antonik), 4.11–28; **Area-depth studies for thunderstorm rainfall, Ill.** (Huff, Stout), 4.11–124; **Variety of atmos. fronts** (Faust), 4.11–136; **Reduction of light by exceptionally heavy rain** (Atkins), 4.11–140; **N. Hemisphere precip. and temp. fluctuations** (Krames), 4.11–161; **Stormy Weather Research Group** (McGill Univ.), 4.11–204; **Theoretical investigation of cloud and precip. physics and dynamics** (McGill Univ.), 4.11–205; **Appraisal of water resources in U. S.** (Bernard), 4.11–230; **Effect of 1951 drought on hydrological regime, Poland** (Debski), 4.11–231; **Moisture requirements in agriculture** (Roe), 4.11–234; **Seasonal breeding and desert locust migration, SW Asia** (Fortescue-Foulkes), 4.11–264.

4.11–215 551.57?

*Decker, Wayne L., **Monthly precipitation in Missouri. Climatic atlas of Missouri, No. 1.** *Missouri. Agricultural Experiment Station, Bulletin*, 572, March **1952.** 80 p. 38 figs. tables. **DA**—An elementary account of the atmospheric circulation over Missouri, of the source of the precipitation over Missouri, and of the physical processes by which clouds produce rain. The author analyzes the average monthly precipitation patterns, the average monthly snowfall and the range of monthly precipitation amounts. Isolines of the monthly patterns of both precipitation and snowfall and the range of monthly precipitation are plotted on maps of Missouri and the monthly precipitation totals and snowfall totals for each year from beginning of record to 1947 for each station are given in tables. A map showing the location of the weather stations in Missouri is included. *Subject Headings:* **1. Precipitation data 2. Precipitation distribution 3. Climatic atlases 4. Missouri.**—*I.L.D.*

4.11–216 551.57?

*Germany. Meteorologisches Amt für Nordwestdeutschland, **60-jährige Mittelwerte des Niederschlags (1891–1950) Britische Zone.** [60-year means of precipitation, 1891–1950 British Zone.] Hamburg, **1952.** 63 p. entirely tables. Mimeo. **DWB**—Monthly and annual averages, as well as totals for the vegetation period (May–July) and half-years collected for over 600 stations. Values given for 1891–1930, 1931–1950 and the whole 60-year period. Data arranged by river basins. No information given on methods of reduction to uniform

periods, extrapolation of missing data, etc. *Subject Headings:* **1. Precipitation data 2. Long period records 3. Germany.**—*A.A.*

4.11–217 551.577.11

SHishkin, N. S., **K teorii letnikh osadkov.** [Contribution to the theory of summer precipitation.] *Meteorologiia i Gidrologiia*, No. 7:17–22, **1952.** fig., 12 refs., 6 eqs. **DLC**—The author points out an inaccuracy in the BERGERON and FINDEISEN theory by which the formation of precipitation is possible only when ice particles appear among water drops in cloud. The original quantitative theory of precipitation falling from water clouds is presented. Special investigations of growth of cloud drops were carried out during 1946–1948 at the Central Geophysical Observatory under supervision of E. S. SELEZNEVA, which showed that the formation of ice particles in clouds stimulated precipitation, but this is not decisive in cases of anabatic flow. It was observed that intensive precipitation may fall from clouds above the freezing point. *Subject Headings:* **1. Precipitation formation 2. Rain from non-freezing clouds 3. Bergeron-Findeisen theory.**—*N.T.Z.*

4.11–218 551.576:551.577.12

*Grunow, Johannes, **Nebelniederschlag. Bedeutung und Erfassung einer Zusatzkomponente des Niederschlags.** [Fog rain. Meaning and estimation of a supplement to precipitation.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 42:30–34, **1952.** fig., 3 tables, 20 refs. **DWB**—An instrument is described for measuring precipitation from hill fog. Observations on Hohenpeissenberg and Nebelhorn show a total precipitation much more than that given by an ordinary rain gage. *Subject Heading:* **1. Liquid water content of clouds.**—*C.E.P.B.*

4.11–219 551.577.2(42)

Gregory, S.; Read, R. S.; Reynolds, G., **Rainfall at Bidston, 1867–1951.** *Royal Meteorological Society, Quarterly Journal*, 79(340):294–295, April **1953.** table. **DWB**—Referring to paper by G. REYNOLDS (*see item* 4.7–158, July 1953, *MAB*), GREGORY points out discrepancies between data quoted and official Meteorological Office data, and further analyzes data. READ queries definition of absolute drought. REYNOLDS explains. *Subject Headings:* **1. Rainfall data 2. Rainfall variations 3. Bidston, England.**—*C.E.P.B.*

4.11–220 551.577.2:551.513.2

Jenista, C. O., Jr. (*Anchorage, Alaska*), **A statistical study of precipitation distribution as related to various types of mean zonal motion.** *American Meteorological Society, Bulletin*, 34(1):10–13, Jan. **1953.** 7 figs., 5 refs. **MH-BH**—Using the zonal wind profile, transmitted from the Andrews Field Air Force Base for 4 winter months, the author distinguishes between two cases, dependent on the location of the wind maximum in high or low latitudes. For both cases frequency maps of precipitation are presented. (Precipitation area in case 1 north from the jet stream and 10° ahead of the trough, in case 2 south from the jet stream and 8° ahead of the trough; additional precipitation to the rear of the trough.) *Subject Headings:* **1. Precipitation areas 2. Jet stream 3. United States.**—*A.A.*

4.11–221 551.577.34

Poncelet, Lucien (*Chief, Climatological Ser., Inst. Royal Met., Belgium*), **Aperçu sur la variation seculaire des précipitations en Belgique.** [Note on the secular variation of precipitation in Belgium.] *La Technique de l'Eau*, [v. 6?] June **1952.** 15 p. 14 figs. Abstracted from reprint. **DWB**—Annual rainfall data in Brussels-Uccle from 1833 to 1951, smoothed over ten years show a generally increasing trend and variations with a length of about 30–40 years. Author discusses similar variations in other part of Europe, America and India, discusses change in the general circulation, which might cause these variations, and gives rainfall distribution maps for Belgium for a number of characteristic years, as well as 5-year mean maps. He comes to the conclusion that real variations definitely exist, but their forecasting is practically impossible. It is better to maintain water reserves. Pluviometer construction should be improved. *Subject Headings:* **1. Rainfall variations 2. Belgium.**—*A.A.*

4.11–222 551.577.35(548)

*Krishna Rao, P. R. and Jagannathan, P. (*Regional Met. Center, Madras*), **A study of the northeast monsoon rainfall of Tamilnad.** *Indian Journal of Meteorology and Geophysics*, 4(1):22–44, Jan. **1953.** 4 figs., 10 tables, 9 refs. **MH-BH**—Extensive data on the rainfall of the northeast monsoon (Oct. to Dec.) for 1870 to 1949 have been analyzed statistically and are presented in tables. The portion of India south of 14°N. lat. has been divided into 11 districts on the basis of rainfall characteristics. Rainfall totals (for the season) and departures from normal for each district are given for each of the 80 years of record, and the normalcy of the records, the extreme abnormalities, frequency of departures by 10% class intervals from +100% to −90%, etc. given for each district. Reasons for abnormalities are discussed. These are related to position of path of cyclonic storms or depressions in the Bay of Bengal. Frequency of such storms in various sectors is tabulated for each year 1906–1950. Inter-district and intermonthly correlations are worked out and also secular changes in NE monsoon rainfall. *Subject Headings:* **1. Monsoon rains 2. Rainfall data 3. Cyclones 4. Bay of Bengal 5. Tamilnad, India.**—*M.R.*

4.11–223 551.577.36 551.577.2

*McConalogue, D. J., **Some data on the intensity and duration of rainfall in various sea areas of the world.** *Baldock, Hertsfordshire. Services Electronics Research Laboratory, S.E.R.L. Technical Journal*, 3(1):19–27, March **1953.** 10 figs., 2 tables, eqs. Mimeo. **GB-MO**—Rainfall intensity-durations at 12 coastal stations for each month are shown as accumulated curves of percentage time for which rates in mm/hr are exceeded. For the 4 British stations curves of the form $T = T_0 \cdot 10^{-\lambda R}$; were fitted, where $T$ is the percentage time for which $R$ mm/hr was exceeded, $T_0$ is a constant and $\lambda$ varied from 0.2 to 0.4. *Subject Heading:* **1. Rainfall depth duration frequencies.**—*C.E.P.B.*

## RAIN

*See also:* **Thunderstorms, Lyon Region** (Favrot), 4.11–122.

4.11–224 551.578.11

Adderley, E. E., **The growth of raindrops in cloud.** *Royal Meteorological Society, Quarterly Journal*, 79(341):380–388, July **1953.** 6 figs., 6 tables, refs. **DWB**—At the C.S.I.R.O. Radiophysics Laboratory, Sydney, Australia, a balloon-borne microphone is frequency modulated by impinging raindrops and transmits a continuous sampling of raindrop size to base. Technique of interpreting records is described. Results for different heights are shown in tables and graphs. Rate of growth of drops falling through a cloud is found to increase with drop diameter 3–4 times as fast as previously computed rates. *Subject Heading:* **1. Drop accretion.**—*C.E.P.B.*

4.11–225 551.578.11:681:77

Green, Robert L., **A photographic technique for measuring the sizes and velocities of water drops from irrigation sprinklers.** *Agricultural Engineering*, 33(9):563–564, 566, 568, Sept. **1952.** 2 figs., table, 4 refs. **DLC**—Photographs of drops moving directly toward camera taken by means of flashlights (1/1000 sec. exposure) give the possibility of measuring the size distribution. Velocities were computed from photographed paths of motion taken from the side (1/100 to 1/200 sec. exposure). A few actual data for sectional area, diameter, length of path, velocity and transverse axis presented. *Subject Headings:* **1. Drop size distribution measurement 2. Drop size photography.**—*A.A.*

4.11–226 551.578.11:551.594.7:621.396.029.6

Rigby, E. Caroline and Marshall, J. S., **Modification of rain with distance fallen.** McGill University. Macdonald Physics Laboratory, Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-3, January **1952.** 51 p. figs., tables, refs., eqs. **DWB**—The radar microwave scattering from rain is most dependent on the size distribution of raindrops. The modification of size distribution is investigated in a detailed manner under three headings: a) accretion of clouds by raindrops, b) coalescence between raindrops and c) evaporation of raindrops. All these processes have considerable modifying effects on micro-

vaves, but are not sufficiently powerful to be basic factors in determining the nature of the lrop size distribution. *Subject Headings:* **1. Raindrop size distribution 2. Microwave scatter-ng 3. Radar wave scattering 4. Cloud physics. I. McGill University. Macdonald Physics Laboratory, Stormy Weather Research Group II. Contract AF 19(122)-217.**—*A.A.*

## SNOW

*See also:* **Radiation and temp. influence on snow cover melting** (Hoeck), 4.11–9; **Snow, Ice, Permafrost bibliog.** (SIPRE), 4.11–13; **Snow research** (Gerdel), 4.11–27; **New method of determining thickness of ice and snow on ice from moving ship** (Tsurikov, Pervakov), 4.11–31; **Soil temp. and frost penetration** (Crawford), 4.11–167; **Snow melting** (Adlam), 4.11–235.

4.11–227 551.578.46

*Bader, Henri; Hansen, Bernard Lyle; Joseph, Jerome A. and Sandgren, Marvin, A., **Preliminary investigations of some physical properties of snow.** Minnesota. University. Institute of Technology. Engineering Experiment Station, Contract DA-21-018-ENG-200 and Contract DA-21-018-ENG-221, Final Report, June **1951.** 48 p. 46 figs., diagrs. (fold.), refs., eqs. *U. S. Snow, Ice and Permafrost Research Establishment, SIPRE Report,* No. **7,** June **1951. DWB**—A valuable, concise study made from the engineering point of view. Methods and instruments for determination of mechanical and other properties of snow are developed (tensile strength, shear strength, penetrability, permeability, moisture content, etc.). The report gives description of the laboratory equipment with sketches and wiring diagrams (sample tubes, hydraulic press, triaxial apparatus, disaggregator, X-ray density gage, tensile strength and shear apparatus, penetrometer, air permeability apparatus, high speed compactor, drop cone apparatus and calorimeter). The theory of the mechanical behavior of snow is outlined, as well as the theory of the measurement of snow properties. A detailed table for the conversion of snow density to absolute porosity is presented and a few preliminary experimental results are discussed (cross section number versus density, specific velocity of deformation of compacted snow, load vs. density, penetration vs. pressure for various snow densities, etc.). *Subject Headings:* **1. Snow laboratory equipment 2. Snow physics 3. Snow mechanics. I. Minnesota. Univ. Institute of Technology. Engineering Experiment Station II. Contract DA-21-018-ENG-200 III. Contract DA-21-018-ENG-221.**—*A.A.*

4.11–228 551.578.46:35(234.3)

§*Switzerland. Armée, **Météorologie et avalanches.** [Meteorology and avalanches.] **1952.** 112 p. 66 figs. **DLC**—Many ways in which weather affects troops (favorably or unfavorably) in the mountains are detailed, but the danger of avalanches is by far the most serious in the Alps. Therefore, it is recommended that every military officer be familiar with the weather—from a synoptic standpoint and also from the "local forecast" point of view (in case he is cut off from communications). A military forecast and avalanche rescue service has been organized, and a manual prepared to give the basic information required for making use of forecasts, observing the weather and predicting dangerous occurrences. This includes information on wind (the cause of avalanches), clouds, föhn, atmospheric disturbances, fronts, effect of weather on animals, signs of good or bad weather, famous "accidents" in the mountains, snow formation and structure, changes, physics of snow, methods of surveying, classes of avalanches, rescue service, precautions to avoid accidents and many other aspects of the problem are treated. Numerous (10) synoptic charts and pertinent tabular data from forty stations in the Alps are included along with excellent photos, charts, graphs, etc. illustrative of the problem. *Subject Headings:* **1. Avalanches 2. Avalanche warning services 3. Snow structure 4. Synoptic studies 5. Mountain meteorology 6. Military meteorology 7. Swiss Alps 8. Switzerland.**—*M.R.*

4.11–229 551.501:551.578.46

*U. S. Corps of Engineers. Snow Investigations, **Hydrometeorological log of the Central Sierra Snow Laboratory 1950/1951 and 1951/1952, water years.** San Francisco, Calif., South Pacific Div., Corps of Engineers, Aug. **1952,** April **1953.** separately paged append. in 1950/

1951 issue. 2 pieces, each about 212 p. photos, diagrs, graphs, tables. On t-p. 1950/1951 issue. U. S. Corps of Engineers and U. S. Weather Bureau. Cooperative Snow Investigations **DWB**—This large report contains in addition to the tables of daily values of all the recorded elements and a composite graphical presentation of the basic data, numerous maps, charts and photographs showing equipment exposures and snow courses (26 stations in all), and a discussion of the sites and the organization, laboratory investigations and processing of data. Radiation, air temperature, dew point, wind pressure, precipitation, snowpack data, ground water level, streamflow and soil moisture data are included in tables and discussion. Hourly values are included in most cases. Snow is classified and described according to a code which differentiates several types of surface aspect, morphology, crystal or grain habit, size and free water content. *Subject Headings:* **1. Snow surveys 2. Climatic data 3. Central Sierra Snow Laboratory, California. I. U. S. Weather Bureau. Cooperative Snow Investigations.**—*M.R.*

## HYDROMETEOROLOGY

*See also:* **Energy conditions, Lake Brienz** (Hofer), 4.11–10; **Fog investigations** (Stewart), 4.11–29; **Lysimeter and Wild balance** (Natermann), 4.11–68; **Evaporability as indicator of water requirement of crops** (Alpat'ev), 4.11–197.

4.11–230 551.579:628.1:551.57

Bernard, Merrill (*U. S. Weather Bur. Wash., D. C.*), **The appraisal of water resources in the United States: analysis and utilization of data; water supply and flood forecasting.** *United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, N. Y. 1949, Proceedings*, v. 4, Water resources, p. 56–64, **1951.** 5 figs., 9 refs. **DWB**—A concise review on hydrometeorological research work in the U. S. The network of precipitation stations increased during the 20 years before 1949 from 4800 to 9900, the network of stream flow stations from 2200 to 5900. The need for additional stations is 4500 precipitation and 3400 stream flow stations. Punched cards were introduced to speed the calculation work. The author gives samples of nomograms for the relation between precipitation and topographic parameters, rainfall-runoff relation and flood routing procedure and shows how to compute a very detailed rainfall map and how progressive forecasts of runoff are made. *Subject Headings:* **1. Water resources 2. Rainfall networks 3. Flood forecasting 4. Runoff 5. Topographic effects 6. United States.**—*A.A.*

4.11–231 551.579:551.577.3

Dębski, Kazimierz, **Wpływ suszy atmosferycznej 1951 roku na stosunki hydrologiczne tego roku i lat nastepnykh.** [The effect of drought of 1951 on the hydrological regime in 1951 and the coming years.] *Przegląd Meteorologiczny i Hydrologiczny*, No. 1/2:50–68, **1952.** 8 figs., 10 tables, eqs. English summary, p. 68. **MH-BH**—Catastrophic shortage of precipitation during summer and autumn of 1951 in Poland caused an intense drying of soil and diminished the levels and runoff of rivers. The water supply gained from the underground water was only a little less than usual. The author presents numerous hydro-meteorological characteristics, compares them with analogous data for the period of 1927–1937, and concludes that noticeable decrease of underground water runoff will be observed during the next year (1952). *Subject Headings:* **1. Drought 2. Water level variations 3. Poland.**—*N.T.Z.*

4.11–232 551.57

*Dębski, Kazimierz, **Bilans wodny zlewni Wisły po Warszawe.** [The water balance of Wisla basin beyond Warsaw.] *Poland. Państwowy Instytut Hydrologiczno-Meteorologiczny, Wiadomości Służby*, 2(2):103–319, **1950.** figs., tables, eqs. **DWB**—Monthly, seasonal and annual data are presented for precipitation and runoff (1921–1937) and daily values for discharge. A detailed method of calculating the depletion curve and retention is developed and annual results for retention, water loss, and the total balance are given. The average annual results for 17 years are: precipitation 665 mm, evapotranspiration 452 mm, average retention from year to year (on Nov. 1) 45 mm. *Subject Headings:* **1. Hydrologic cycle 2. Depletion curves 3. Wisla River, Poland.**—*A.A.*

4.11–233 551.579(02)

*Mead, Daniel Webster, **Hydrology: the fundamental basis of hydraulic engineering.** 2nd ed. rev. and enl. by Mead and Hunt. N. Y. McGraw-Hill, **1950.** 728 p. illus. diagrs., maps, graphs, bibliog. Chap. on "Drought" by Henry J. Hunt. **DWB, DLC**—It has been said that the science of hydrology was founded in the set of notes which PROF. MEAD used for 20 years in his lectures at the Univ. of Wisconsin before publishing them in 1904. In 1919 these notes were expanded and published as the first edition of this classic text. Although still alive and collecting materials for this 2nd edition, the health of the author was such that the actual revision was made by his son HAROLD and HENRY HUNT, an associate. The first edition contained many chapters on the meteorological aspect of hydrology [atmospheric circulation, pressure, winds, storms, moisture and evaporation, precipitation and all of its variations, rainfall measurement, annual, seasonal rainfall in the U.S.A.], record samples, droughts, effect of altitude on rainfall, etc. The revised edition brings these up to date and in addition takes up air masses, fronts, theory and measurement of evaporation, statistical methods, in hydrological analysis, forecasting, artificial rainfall and its consequences, the Thiessen method of weighting precipitation records for areas of droughts in the 1930 decade, the unit hydrograph method for flood routing, etc. The work contains voluminous reference lists with each chapter, and there are many schematic charts, diagrams showing series of typical weather situations, isohyetal charts and correlation diagrams of various rainfall parameters. Most of the references are to works in American journals. *Subject Headings:* **1. Hydrology 2. Hydrometeorology 3. Textbooks. I. Hunt, Henry J. II. Mead, Harold W.**—*M.R.*

4.11–234 551.579:631:551.577(02)

*Roe, Harry Burgess, **Moisture requirements in agriculture; farm irrigation.** N. Y., McGraw-Hill, **1950.** 413 p. graphs, tables, diagrs., biblio. Price $5.50. **DWB**—Besides many chapters on the details of irrigation, drainage, soil science, water use, and hydrology, Chap. II deals with primary sources of moisture, general controls, measurement and recording of precipitation including snow, distribution of precipitation in the U. S., frequency and intensity of storms in different parts of the U. S., the disposition of precipitation (by evaporation, transpiration, seepage and runoff, storage in lakes and reservoirs, water spreading and recharging of ground water, etc.) Numerical examples are worked out and considerable data given in tabular and graphic form. Chap. XIV, on Supplemental irrigation in humid regions, gives frequency of dry periods up to 3 weeks in midwest U.S.A. *Subject Headings:* **1. Soil moisture sources 2. Hydrologic cycle 3. Irrigation and drainage 4. Drought 5. Agriculture 6. Textbooks 7. United States.**—*M.R.*

4.11–235 551.579.2:551.578.46:656(02)

*Adlam, Thomas Napier (*V.B. Sarco Mfg. Corp.*), **Snow melting.** N. Y., Industrial Press, **1950.** 224 p. fig., tables, eqs. Price $4.50. **DWB**—A book giving meteorological and engineering data and information necessary for designing, installing, controlling and operating snow melting systems (using hot water pipes embedded in sidewalks, highways, loading platforms, landing strips, etc.). Cost of installation and operation for small areas (sidewalks and platforms) is surprisingly low (Chap. I). In Chap. II, U. S. Weather Bureau data for date of first snowfall, number of days with snow cover, amount of snow (average and extreme values), frequency of snowfall, etc. are given in tables, on charts and are discussed for the U. S., Canada and Alaska. Effects of rate of fall, low temperatures, high winds at low temperature, density of snow, albedo and other factors considered. Two severe storms in the New York area are cited, with graphs showing variable rate of snowfall and tables showing hourly accumulation depths. Part of the efficiency of these installations depends on the greater absorptive capacity (for sun's rays) of dark surfaces over clear snow. Once the melting begins, natural thawing is much more rapid. In Chap. 7, on antifreeze solution, the average minimum temperature for the year throughout the U. S. is considered. Automatic controls (Chap. 8) depend on a weighing type of snow gage, or a photoelectric cell to indicate when snow cover begins and ends (on surface in question). The remainder of the book is devoted to design data and examples of actual installations under heavy snow conditions. *Subject Headings:* **1. Snow melt**

**2. Snow cover data 3. Snow removal 4. Manuals 5. United States 6. Canada 7. Alaska.** —*M.R.*

4.11–236 551.579.5

Aristovskiĭ, V. V., **Infil'tratsiia atmosfernykh osadkov.** [Infiltration of atmospheric precipitation.] *U.S.S.R. Tsentral'nyi Institut Prognozov, Trudy*, 12(39):34–60, **1949.** 16 figs., 11 refs., 44 eqs. **DLC**—Detailed theoretical and experimental study. Author strongly distinguishes between the initial absorption or soaking state and the final "filtration" state, when the law of Darcy can be applied. A critical summary of Russian theoretical work is given at first and the following formula for the velocity of "absorption" $v$[cm.sec$^{-1}$] is proposed: $v=\frac{k_p}{t}$; $t$—time; $k_p=c(n-w_k)\phi$; $n-w_k$—free porosity; $w_k$—volume content of capillar water $\phi=F_g/F_\sigma$, $F_g$—weight of moving water, $F_\sigma=\frac{2\sigma}{r}$ meniskus force; $c,\sigma$—coefficients, $r$—radius of capillar. The amount of water necessary for the complete saturation of the soil from the ground water up to the surface is $H=k_p\, ln\, \frac{t_k}{t_o}+kl$; $kl=n-w_m$; $t_o$—constant dependent on the moisture content of the surface layer at the beginning of the process $t_k$—time, when the infiltration rate is getting constant; $t$—time, necessary for the gravitational motion of the water in the distance of $d$ down to the ground water. Applications to different soils and slopes discussed. *Subject Headings:* **1. Infiltration 2. Soil moisture 3. Hydrologic cycle.** —*A.A.*

4.11–237 551.579.5:551.525.4

Yabuki, K., **On the temperature of the ground and water in the percolating paddy field (1, 2).** *Journal of Agricultural Meteorology*, Tokyo, 7(1, 3/4):13–14, 145–148, Dec. **1951,** Nov. **1952.** 7 figs. In Japanese; English summaries p. 14, 148. **MH-BH**—Measurements of percolation made with a lysimeter of new design are reported. Part 1 of the report includes description and illustration of the instrument and determination of thermal diffusibility and of amplitude of diurnal ground temperature variation as functions of degree of percolation. Pt. 2 gives an account of vertical and horizontal distribution of water temperature in a paddy field with continuous cold and warm water supply, as obtained both in the open field and under laboratory conditions. *Subject Headings:* **1. Percolation 2. Soil temperatures 3. Agricultural meteorology 4. Lysimeters.**—*G.T.*

# CLIMATOLOGY AND BIOCLIMATOLOGY

## CLIMATOLOGY

*See also:* **Complex climatology** (Chubukov), **4.11–253.**

4.11–238 551.58

Bagrov, N. A., **O nekotorykh voprosakh klimatologii.** [On some problems in climatology.] *Meteorologiia i Gidrologiia*, No. 7:1–9, **1952. DLC**—Discussion on problems in climatology. The author indicates that climatology at present cannot serve the practical requirements in full measure, because the processes of climate formation have not been sufficiently investigated and the materials of meteorological observations have not been utilized sufficiently. Many important problems of climatological investigation have not been given the proper attention from climatologists, and sufficient observational data of evaporation, heat and radiation balance and moisture circulation are not available. The author critically reviews the works, recently published, by Sashin, Pogosian, Lebedev, Skliarov, KHromov, and concludes that first it is necessary for the climatologists to develop a theory of climate, to investigate the problem of physical and geographical relations and of climatic changes under human influence. For greater effectiveness of climatological investigation the application of punched cards is desirable. *Subject Heading:* **1. Problems in climatology.**—*N.T.Z.*

4.11–239 551.58:519.241.5

Hernández, Haydée (*Serv. Met., Uruguay*), **La media aritmética y su aplicación en climatología.** [The arithmetic average and its application to climatology.] *Revista Meteorológica,* Montevideo, 11(42/43):302–308, July/Oct. **1952.** 5 refs. **MH-BH**—The arithmetic mean, as is explained, is more of a representative value in physics, where the observed series are homogeneous, than in climatology, where such homogeneity does not exist. The relative usefulness of the arithmetic mean and of the "normal" in climatological studies is discussed with particular emphasis on the significance of the frequency of occurrence of the median value. *Subject Headings:* **1. Climatology 2. Statistical studies.**—*G.T.*

## CLIMATE OF PARTICULAR PLACES

4.11–240 551.582:63(529)

*Chen, Chwen-shu (*Univ. of Formosa*), **The agro-climate of Formosa.** *Taihoku, Formosa. National Taiwan University. Faculty of Agriculture, Memoirs,* 2(1):1–60, Jan. **1948.** 51 tables, 41 figs., refs. In Chinese, English summary p. 51–60. **DLC**—In addition to long-period climatic data and climatic charts, this study includes descriptive accounts of the climate of Formosa as a whole and of each of its seven climatic regions, mainly determined by orographic properties. The effect of various climatic factors on agriculture is considered. Characteristic features of the climate of Formosa are NE and SW monsoons, rainy and dry seasons alternating twice a year, and frequent typhoons which are the most destructive calamities among those occurring on the island. *Subject Headings:* **1. Climate of Formosa 2. Agricultural meteorology 3. Climatic regions 4. Long period records 5. Formosa.**—*G.T.*

4.11–241 551.582(438)

*Zych, Stanisław, **Uwagi o klimacie Pomorza.** [Remarks on the climate of Pomerania.] *Przegląd Meteorologiczny i Gydrologiczny,* No. 1/2:82–91, **1952.** 6 tables, 7 refs. **MH-BH**—The climate of Pomerania varies from a maritime type in the NW to a continental eastern European type in the SE. The author presents a summary of temperature, pressure, wind, precipitation, cloudiness and snow cover data based on long period observations (observation period is not indicated). *Subject Headings:* **1. Climatic data 2. Pomerania, Poland.**—*N.T.Z.*

4.11–242 551.582.1/2(43)

†*Goetze, Karl (*Solingen*), **Wetter, Klima und Leben im Bergischen Lande.** [Weather, climate and life in Berg (N. Rhine Province).] Wuppertal-Elberfeld, A. Martini & Gruttefien, **1951.** 89 p. 17 tables, 15 graphs, 29 refs. **DLC**—The first part of this book contains a description of the climate of Berg which belongs climatically to the North Atlantic climatic region, more specifically to the Rhineland climatic region: the annual course of temperature, relative humidity, cloudiness, sunshine, and precipitation; the frequency and characteristics of thunderstorms; phenological observations; and various comments upon the effect of the climate and of its individual varieties upon human welfare are discussed; and the mean monthly climatic data for various stations are given. The subdivision of the plateau of the Bergisches Land leads to numerous valleys with local climatic characteristics. Accordingly the climatic characteristics of the Wuppertal and adjoining valleys are analyzed and local climatic data are given. Measures for climatic amelioration are discussed. In the third part the author gives an account of the annual weather process on the basis of observation made at Solingen (Bergisches Land); the discussion includes singularities and weather sequences, the natural weather divisions of the year and the causes of weather waves. *Subject Headings:* **1. Climate of the Rhineland, Germany 2. Climatic amelioration 3. Singularities 4. Rhineland, Germany.**—*I.L.D.*

4.11–243 551.582.1(497)

*Kovačević, Milan (*Hydro-Met. Service, Yugoslavia*), **Einige Klimabesonderheiten der östlichen Adriaküste und des zugehörigen Hinterlandes.** [Some climatic characteristics of the East Adriatic Sea and adjoining hinterland.] *Geofisica Pura e Applicata,* 21:147–158, **1952.** 4 figs., 4 tables, refs. English summary p. 147–158. **MH-BH**—In order to describe more precisely the climate of the eastern Adriatic coast and of the adjoining northwestern interland of the Balkan peninsula, the author determined the sea level distribution of tem-

perature using a ten year mean of 250 stations and analyzed the annual temperature variations Charts show Jan., July and mean annual isotherms and data on the mean monthly and annua temp. (50 years mean) and mean absolute temp.; extremes for typical stations along the coas and hinterland are presented. The extremes of a fairly developed center of warmth over th southern portion of the coast and of well developed cold areas behind the high ridge of th Dinara mountains are distinguished and their difference is explained by the influence of th sea water and intrusion of cold air masses respectively. *Subject Headings:* **1. Coastal climate 2. Temperature variations 3. Adriatic Sea.**—*I.L.D.*

4.11–244 551.582.2(436):551.506:551.52

*Austria. Hydrographisches Zentralbüro, **Die Lufttemperaturen in Österreich im Ze traum 1901–1950.** [Air temperatures in Austria, 1901–1950.] *Austria. Hydrographische Zentralbüro, Beiträge zur Hydrographie Österreichs*, No. 23, **1951.** 256 p. mostly tables, appends. (fold., one in pocket). **DWB**—The best source of temp. data for Austria, publishe by the Hydrographic Bureau (which justifies this unusual step because of importance of temp. comparing evapotranspiration from catchment areas. Data given for 357 stations, while th last corresponding publication of the "Meteorologische Zentralanstalt" contains only 6 stations. Means apparently are based on observation at 7, 14 and 21 o'clock, and are nc adjusted to the true 24-hour mean. Monthly and annual mean values, arranged by rive basins, are given for each ten years for 1901–1925 and 1926–1950 as far as available, as we as for the whole observation period. An appendix gives mean and extreme daily values fo 9 selected stations. Network of stations shown on hydrographic map with isohypses (1 500,000). *Subject Headings:* **1. Temperature data 2. Temperature singularities 3. Austria I. John, Erich** (*comp.*).—*A.A.*

4.11–245 551.582.2(438

*Wiszniewski, W., Gumiński, Romuald and Bartnicki, L., **Przyczynki do klimatolog Polski.** [Contributions to the climatology of Poland.] *Poland. Państwowy Instytu Hydrologiczno-Meteorologiczny, Wiadomości Sluzby*, 1(5):345–372, **1949.** mostly tables, chart (fold.), refs. English summary and headings. **DWB**—Tables of mean monthly and annua temp., mean diurnal, monthly and annual maxima, minima and range of temp.; absolut maxima and minima, ice days, frost days, hot days, very cold and very hot days, mean an extreme days of latest and earliest killing frost and length of frost-free period. Maps wit mean monthly and annual actual isotherms (intervals 0.5°C) are added. Regarding th international agreement for the normal period 1901–30, the period used is 1881–1930, i accordance with the "Klimakunde des Deutschen Reiches" (1939) from which data for th former Eastern Germany are taken. A list is given showing the new Polish names of meteor logical stations. *Subject Headings:* **1. Climate of Poland 2. Climatic data 3. Climatic chart 4. Temperature distribution 5. Poland.**—*A.A.*

## CLIMATIC CHANGES

*See also:* **Secular change of N. Pacific High** (Yamamoto), **4.11–129.**

4.11–246 551.583(0

Brooks, Charles E. P., **Klimaty proshlogo.** [Climate through the ages.] Trans. by V. ( Levinson; ed. by B. P. Alisov and V. I. Gromov. Moscow, **1952.** 356 p. 39 figs., 29 table refs. **DLC**—A complete and only slightly abridged translation into Russian of the secon (1949) edition of C. E. P. Brooks' famous book on the climate of the geological and historic past (*see item* 3–121, March 1950, *MAB*). A 4-page introduction by one of the editor similar to a review which appeared in *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia* credi Brooks' work with presenting a completely critical survey of the various theories of climat change, and of containing much interesting material for astronomers, geographers, geologis and climatologists, and in spite of many obvious deficiencies which are enumerated (main ignorance of most recent Russian works), it is not as bad as most capitalistic treatises. Certai portions dealing with the heretical ideas of Huntington and his school have been expurgate as being anti-Marxist, but on the whole the translation is faithful and accurate, and presente

n a high quality edition, with good reproduction of charts and diagrams, and few typographical errors. *Subject Headings:* **1. Climatic variations 2. Historical climates 3. Paleoclimatology 4. Translations. I. Levinson, V. G.** (*trans.*).—*M.R.*

4.11–247 551.583.13:523.746

Visser, S. W., **Extrapolation of sunspot-climate relationships.** *Journal of Meteorology*, 10(3):232–233, July **1953.** table, 7 refs. **MH-BH**—Referring to items 2.8–42 and 3.11–75, Aug. 1951, Nov. 1952, *MAB*, author presents a third method of forecasting sunspots and concludes that the next maximum will be a strong one. The present period is one of rather normal winters in western Europe. *Subject Headings:* **1. Sunspots 2. Climatic variations.**—*C.E.P.B.*

4.11–248 551.583.2(47)

†Bushinskiĭ, I. E., **K voprosu ob izmenenii klimata USSR v istoricheskuiu epokhu.** [The question of changes in the climate of the Ukrainian SSR during historical times.] *Meteorologiia i Gidrologiia*, No. 5:34–36, **1952.** 11 refs. **DLC**—The author uses for investigation of the problem not only the works published before, but also materials of so called "letopisi" (chronicles) in which, for the period from the 9th to the 16th century, various remarkable facts were recorded, among others special remarks about weather (cold winter, hot summer, drought, high spring floods, intensive hail, etc.). The author concludes that the existing material does not indicate any noticeable variations of climate of the Ukraine since the 9th century. *Subject Headings:* **1. Historical climates 2. Ukraine.**—*N.T.Z.*

4.11–249 551.583.2

Pfannenstiel, Max (*Freiburg im Breisgau*), **Quartäre Spiegelschwankungen des Mittelmeeres und des Schwarzen Meeres.** [Quaternary sea level variations of Mediterranean and Black Seas.] *Naturforschende Gesellschaft, Zürich, Vierteljahrschrift*, 96(2):81–102, June 30, **1951.** 4 figs., 21 refs. **DWB**—A summary of geological, hydrographic and biological facts showing the sea level variations due to climatic changes. The sea level during the Riss-Würm interglacial period was 12–15 m above the present level and 90 m below the present level during the Würm glacial period. Other sea level variations in previous periods are briefly discussed. The supposed climatic changes are verified by the residues of subtropic and subarctic fauna and flora in different levels. *Subject Headings:* **1. Climatic changes 2. Quaternary climates 3. Sea level changes.**—*A.A.*

## MICROCLIMATOLOGY

*See also:* **Tropical rain forest** (Richards), 4.11–12; **New hydrometer for study of microclimates** (Goillot), 4.11–56; **Thermo-element for microclimatic measurements** (Unger), 4.11–64; **Calculation of daily temp. variations in air layer near ground** (Laĭkhtman), 4.11–162; **Temp. regime of air layer near ground** (Rudnev), 4.11–163.

4.11–250 551.584:551.586:632.9

†Schrödter, Harald, **Agrarmeteorologische Beiträge zu phytopathologischen Fragen mit besonderer Berücksichtigung der Bedeutung des Mikroklimas für Pflanzenkrankheiten.** [Agricultural meteorological contributions to questions of plant pathology with special reference to the importance of microclimate for plant diseases.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen*, 2(15), **1952.** 3 p. 17 figs., 12 tables, 201 refs. **DWB**—A valuable study of the literature of the past 10 years on the effect of climate on plant diseases includes temp. and humidity of air and soil, rain, wind and light, and a critical consideration of methods hitherto employed. The necessity for field studies is emphasized. Author then shows the importance of microclimate, including plant surfaces and cavities in plant infection. Dew is especially important and a thermoelectric method of measuring its persistence is described. Plants considered are cabbage, cauliflower, raspberry, poppy heads. He ends with remarks on the application of such studies for plant protection and the value of a warning service. *Subject Headings:* **1. Microclimatology 2. Agricultural meteorology 3. Plant diseases.**—*C.E.P.B.*

4.11–251 551.584.3/4:631.

Arkhipova, E. P. and Glebova, M. IA., **Nekotorye dannye o klimate oroshaemogo polia** [Some data on the climate of an irrigated field.] *Meteorologiia i Gidrologiia*, No. 6:8–11, **1952.** 2 figs., table. **DLC**—Report on observations carried out by the Central Geophysical Observatory in Kamennaia Step' (Voronezh province). These comparative observations were made in a field one part of which was irrigated. The difference in soil temperature between the irrigated sections and the part without irrigation reached 28°C near the soil surface; at a depth of 5 cm it was 6–7°, and at 20 cm about 4°. Air temperatures showed greatest differences in the layer near the ground; at a height of 20 cm above the soil surface on clear days it varied up to 9–10°C. Over the surface of vegetation the difference diminished: for 20 cm over planted surface it was about 3°C, at 60 cm, about 1–2°C. The air humidity also was higher over the irrigated section (at height of 20 cm the difference was 2 mb or 40–50% relative humidity). Such peculiarities were observed during clear, sunny days. In cloudy weather these differences were much lower. *Subject Headings:* **1. Soil climates 2. Plant climate 3. Irrigation effects.**—*N.T.Z.*

4.11–252 551.584.6

Trumpaĭts, IA. I., **K voprosu o normirovanii luchistogo obogreva vo vremia otdykha v proizvodstvennykh pomeshcheniiakh s subnormal'nymi polozhitel'nymi temperaturami.** [The problem of regulating radiant heating during the rest period in working rooms with subnormal, positive temperatures.] *Gigiena i Sanitariia*, 7:27–34, July **1952.** 6 figs. **DLC**—The relationship between indoor temp. in work rooms and outside temp. during the different seasons and the problem of maintaining normal temp. in work rooms when the air temp. is positive but subnormal, are discussed. Experimental observations under laboratory conditions on use of local radiant heating in work rooms with air temp. of 0 to 10°C are summarized. The intensity of radiation in various parts of the body and the temp. of these parts at air temp. of 10° and 18°C were measured and the data presented graphically. *Subject Headings:* **1. Indoor climates 2. Industrial climatology 3. Radiant heating.**—*I.L.D.*

## CLIMATIC CLASSIFICATION

4.11–253 551.58:551.585(47

†Chubukov, L. A., **Kompleksania klimatologiia.** [Complex climatology.] Moscow, Akademiia Nauk, S.S.S.R., **1949.** 94 p. 22 figs., 7 tables, bibliog. p. 81–84. **DLC**—A thorough exposition of the principles and methods of "complex climatology" as presented in previous articles (*see item* 2.2–127 and 2.2–128, Feb. 1951, *MAB*) and promulgated by E. E. Fedorov (1921) and to some extent by Howe (1925), Switzer (1925) and Nichols (1925). The wind, temperature, cloudiness, relative humidity, precipitation, snow cover and hydrometeors are integrated according to a complex system of symbols and subscripts, etc. for each day and the types represented graphically, either for a station, an area, a vertical cross section or as frequency distributions, or to compare seasons or years. Isopleths can be drawn for any one element for a large area such as the Soviet Union, or climatic changes over a century can be depicted graphically. Correlations can be made with harvests, or phenological events. Application is also possible to transportation, aviation and medical problems. Many examples of the above applications and illustrations of the methods are presented. It is mentioned that the method has been met with some "skepticism," but these objections are outweighed by the general acceptance of the soundness of the concept by Soviet climatologists. The chief objection is to the technical complexity of this "complex climatology." It is far more intricate than Köppen's or Thornthwaite's methods. But by the same token, advantages stem from its complexity as it provides a greater challenge to teachers and students as well as bureaucrats for it keeps students or employees busy for longer periods in obviously impressive calculations, correlations, drafting and cartography than does any other system yet devised. Thirty or more references to works of E. E. Fedorov are given. *Subject Headings:* **1. Climatic classification 2. "Complex" climatology 3. Textbooks 4. U.S.S.R.**—*M.R.*

4.11–254 551.585

**La classificación de los climas.** [Climatic classification.] *Revista Meteorológica*, Monteideo, 11(39/40):131–207, Oct. **1951**/Jan. **1952.** diagrs., tables, refs. **DWB**—This issue is evoted to the works of four authorities on climatic classification. It includes translations nto Spanish from the introduction of PETTERSSEN's "Meteorology" and from KÖPPEN's Climatology," a paper entitled "New presentation of basic facts for agro- and phyto- climatoogical purposes" by WALTER KNOCHE, and a review of THORNTHWAITE's classification by ALFONSO CONTRERAS ARIAS. An article by LUIS MORANDI is appended under the title Síntesis de las características fundamentales del clima del Uruguay" (*see item* 4.8–224, Aug. 953, *MAB*). All papers are in Spanish. *Subject Headings:* **1. Climatic classifications . Translations.**—*G.T.*

## BIOCLIMATOLOGY

*See also:* **Importance of microclimate for plant disease** (Schrödter), 4.11–250.

4.11–255 551.586:159.9

Yamaguchi, S. (*Kyoto Univ.*), **Study of the psychological effect of weather** (2). *Meteorogical Society of Japan, Journal, 2nd Ser.*, 30(9):281–288, Sept. **1952.** 7 figs., 7 tables, 6 refs. n Japanese; English summary p. 281. **DWB**—Police-record figures of frauds, bicycle thefts nd petty larceny are compared with data on precipitation, wind velocity, humidity, temp., ressure, etc. "Unbiassed variance" of the occurrence of the crimes is obtained by eliminating hysical effects of weather. The psychological effects of weather factors, according to the uthor, can be found in the fact that they induce some individuals to carelessness and thus cause hem to become victims of crimes such as those named above. (For part I *see item* 2.11–172, Jovember 1951, *MAB*.) *Subject Headings:* **1. Psychological effects of weather**—*G.T*

4.11–256 551.586:551.45

†Adolph, Edward Frederick (*Dept. of Physiology, Rochester Univ.*) and others, **Physiology f man in the desert.** N. Y., Interscience Publishers, **1947.** 357 p. figs., tables, refs., ibliog. p. 352. On t-p: Information contained in this monograph derived from work done nder Contract OEMcmr-206. *Monographs in the Physiological Sciences.* **DLC**—A group of mportant papers by E. F. ADOLPH and a number of associates working under contract with he Committee on Medical Research of the U. S. Office of Scientific Research and Developnent. Many physiological processes such as sweating, heat exchange of the body, blood irculation, dehydration, urination, exhaustion, thirst, etc. were tested under desert or simuated desert conditions, and the quantitative results presented and analyzed. The problem f water losses of man on life rafts (BROWN, GOSSELIN and ADOLPH) was considered and the olution involving maps of ocean temperatures, rainfall, winds, discussed. The difference etween wet bulb temperatures (with respect to comfort) in the desert and the tropics (humid) s illustrated graphically. *Subject Headings:* **1. Physiological climatology 2. Deserts. I. Goselin, R. E. II. Brown, A. H. III. Rochester University IV. Contract OEMcmr-206.**—*M.R.*

4.11–257 551.586:599.9

Missenard, André, **Klima und Lebensrhythmus. Mit einem Vorwort von Dr. Alexis Carrel.** [Climate and the life rhythm. With a foreword by Dr. Alexis Carrel.] Meisenheim m Glan, Anton Hain, **1949.** 208 p. 28 figs., bibliog. p. 207–208. Appended: Foreword o the German translation, by H. Lossnitzer. Title of original: **A la recherche du temps et du ythme. 1940. DLC**—The various ways in which climate affects human life are clearly iscussed and illustrated in the several chapters of this book. The German translation of the rench text (which appeared at the beginning of the war) has the figures (mostly from HUNTNGTON and MILLS) redrawn so as to be more readable. The first part of the book goes into he relations between the organism and its environment, evolution, variations, effect of temerature on cells and living organisms; effect of humidity and wind, clothes, heat transfer; utrition, biological processes and therapy. Pt. II takes up weather, health and distribution f civilization, migration, health, diseases, etc. Pt. III treats city and rural climates and effect n health, death rate, birth rate, infants, working conditions, and climatic changes. Pt. IV

briefly covers the social effects of climate (morals, politics, religion, wars, etc.). The author uses a great deal of the HUNTINGTON data but uses it more critically than some writers. *Subject Headings:* **1. Bioclimatology 2. Climate and man 3. Translations. I. Schlötermann, Lilo II. Huntington, Ellsworth III. Carrel, Alexis IV. Lossnitzer, H.** (*trans.*)—*M.R.*

4.11–258 551.524:551.586:612

Bartlett, D. J. and Gronow, D. G. C., **Manual dexterity and tactile sensitivity in the cold.** *Great Britain. Flying Personnel Research Committee, F.P.R.C.* 806, **1952.** 20 p. 16 figs., 9 tables. Mimeo. **GB-MO**—Several tests are described which were used on subjects: 1) exposed to −10°C for ½, 1 and 1½ hours in a cold chamber, and on leaving it; 2) at room temp.; 3) before and during 40 min in cold chamber. Exposure to cold prevented normal improvement with practice in manual dexterity tests, but not in sensitivity until a sudden lowering of temperature by a wind factor was introduced. Results were related to skin temp. of fingers. *Subject Headings:* **1. Physiological climatology 2. Temperature effects.**—*C.E.P.B.*

4.11–259 551.586:612:551.590.21

*Reiter, Reinhold, **Beziehungen zwischen Sonneneruptionen, Wetterablauf und Reaktionen des Menschen, dargestellt am Verlauf der Infra-Langwellenstörungen, der Geburtenziffer und der Verkehrsunfallziffer.** [Relations between solar eruptions, weather and human reactions, shown by the course of infra-longwave disturbances, birth rates and figures of traffic accidents.] *Angewandte Meteorologie,* 1(10):289–303, June **1953.** 6 figs., table, 63 refs. **MH-BH**—The most important solar phenomena and their terrestrial consequences are described and their use in helio-biological statistics examined. The method of investigating longwave (J) disturbances, and their relation to regional (not world-wide) thunder activity and lability, are explained. It is found that in Germany and Austria, 2 days after a chromosphere eruption near the central meridian, births, traffic accidents and J disturbances all increase. Eruptions on the east edge of the sun bring an immediate increase, and a further increase 4–6 days later. Author considers that biological relations to solar activity are indirect, through weather effects. *Subject Headings:* **1. Solar influences 2. Bioclimatology.**—*C.E.P.B.*

4.11–260 551.586:612.2:523.745

Köhler, Udo, **Die Wettervorfühligkeit—ein solarer Effekt.** [Weather pre-sensitivity—a solar effect.] *Naturwissenschaften,* 40(13):360–361, July 1, **1953.** fig., 5 refs. **DWB**—The Mögel-Dellinger effect on short-wave radio occurs at least 26 hours before corpuscular solar radiation reaches the earth and affects the weather. To test this, reception on 25 m transatlantic radio 22–23 hrs was compared with pain-intensity of a very weather-sensitive man the same night from Dec. 10, 1952 to March 31, 1953; the two curves run closely parallel, showing that weather-sensitivity is due directly to electromagnetic radiations from solar eruptions. *Subject Headings:* **1. Weather sensitivity 2. Solar activity.**—*C.E.P.B.*

4.11–261 551.586:616

Harry, Walter, **Lebensbedrohliche Zustände nach Venen-Injektionen zum Teil mit tödlichem Ausgang, in Zusammenhang mit der Wetterlage. (Drei allergische Katastrophenschocks bei intravenöser Anwendung von Vitamin $B_1$).** [Dangerous conditions after venous injections, partly fatal, associated with the weather condition (Three allergy shocks on intravenous administration of vitamin $B_1$).] *Annalen der Meteorologie, Medizin-Meteorologische Hefte,* No. 8:98–106, **1953.** 4 figs., 5 refs. **DWB**—Three cases are described, one fatal, associated with persistent easterly type and low inversion over polluted surface air rich in nuclei. Air-mass sections up to 12 km are shown. *Subject Heading:* **1. Medical climatology.**—*C.E.P.B.*

4.11–262 551.586:616

Straube, G., **Die bioklimatische Diagnostik und Therapie in der klinischen Praxis.** [Bioclimatic diagnostics and therapy in clinical practice.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte,* No. 8:68–74, **1953.** 3 figs. **DWB**—Reaction to climatic processes depends on constitution. The daily rhythm in weather causes a daily rhythm in

reaction as shown by acetylcholine or adrenalin electrophoresis tests. This is the basis of author's clinical practice. Examples of case cards are given. *Subject Headings:* **1. Bioclimatology 2. Climatotherapy.**—*C.E.P.B.*

4.11–263 551.586:63

Holdefleiss, Paul, **Ziraat meteorolojisi.** [Agricultural meteorology.] Trans. by Umran Emin Çölaşan (Turkish Met. Serv.). *Meteorolojik Yayinlar Serisi*, Ankara, No. 5, **1947.** 112 p. 17 tables, 4 figs. Price: 200 Piasters. **DWB**—Complete translation of his "Agrarmeteorologie" (Berlin, 1930). After definition of agricultural meteorology and of its basic factors, the author examines the effect of the chemical components of the air upon biological properties of the soil and upon vegetation. He discusses dust particles as condensation nuclei and describes the whole mechanism of atmospheric phenomena as characterized by humidity, precipitation, pressure, frontal activities, winds, large-scale circulation, radiation balance, etc. Particular attention is paid to the effect of geographic latitude and of mountain ranges upon the climate. The effect of weather and climate upon vegetation is discussed with emphasis on the amount of crops as a function of weather elements (research undertaken in this field is reviewed), particularly in central Germany. *Subject Headings:* **1. Agricultural meteorology 2. Translations. I. Çölaşan, Umran Emin** (*trans.*).—*G.T.*

4.11–264 551.586:551.577.3:632.7

Fortescue-Foulkes, J., **Seasonal breeding and migrations of the desert locust** (*Schistocerca gregaria* **Forskål) in southwestern Asia.** *Anti-Locust Memoir*, London, 5, **1953.** 35 p. 14 maps, fig., table, 39 refs. **DA**—Records of swarms and hoppers in SW Asia were plotted and analyzed. A cyclic migration was found, related to monsoons and seasonal rainfall in Pakistan and NW India. *Subject Headings:* **1. Locusts 2. Animal ecology 3. Southwest Asia.**—*C.E.P.B.*

## ENVIRONMENTAL EFFECTS

*See also:* **Tropical rain forest** (Richards), 4.11–12; **Snow, Ice and Permafrost bibliog.** (SIPRE), 4.11–13; **Changes of water content of intruding stationary sea fogs due to capturing action of leaves and branches** (Fukutomi), 4.11–211; **Combined effect of falling drop, temp., diffusion on fog reduction** (Hori), 4.11–212.

4.11–265 551.588.4(7)

Lautzenhiser, R. E. (*U. S. Weather Bureau, Chicago*), **Great Lakes weather.** *Weatherwise*, 6(1):3–6, Feb. **1953.** figs. **MH-BH**—The effect of water masses of the Great Lakes upon the weather of surrounding areas is investigated. Such effects are found in excessive snowfalls, increased aircraft icing, delay of spring blooming season, lake breezes, changes in barometric pressure, temperature and humidity, etc. Isothermal and isohyetal charts of the region are presented. The author also discusses some weather features of the area which are not influenced by water masses. *Subject Headings:* **1. Lake influences 2. Great Lakes Region.**—*G.T.*

# MISCELLANEOUS APPLICATIONS

## SOLAR INFLUENCES

*See also:* **Study of radio reflections from meteor trail in upper atmos. research** (McNish), 4.11–92; **Moon and thunderstorms** (Karapiperis), 4.11–121; **Relation between solar eruptions, weather and human reactions** (Reiter), 4.11–259.

4.4–266 551.590.21:523.7

Harvard University. **[Establishment of a solar observatory at Sacramento Peak, New Mexico.]** Contract W19-122ac-17, Report of Progress No. 11–12, Feb. 1–May 1, **1951.** v. **DWB**—Contains brief descriptions of the projects on various aspects of solar activity and solar characteristics. Studies were made on solar prominences, the relation between geomagnetic disturbances and weather, absorption lines, etc. *Subject Headings:* **1. Solar activity 2. Geomagnetic disturbances 3. Solar influences. I. Chase, Herbert E. II. Contract W19-122ac-17.**—*I.L.D.*

4.11–267 551.590.21 551.543:550.385:551.521.63

Koppe, Heinrich, **Solare Aktivität und Atmosphäre.** [Solar activity and the atmosphere.] *Zeitschrift für Meteorologie*, 6(12):369–378, Dec. **1952.** 3 figs., 2 tables, 68 refs. **MH-BH**—Various studies on the relationship of sunspot cycles with variations in atmospheric temperature, atmospheric circulation and precipitation and studies on the relationship of short term variation in solar activity as expressed by the geomagnetic characteristics and oscillations in atmospheric pressure are summarized briefly. By means of a statistical evaluation of data on geomagnetic characteristics from BARTELS and the Wingst Observatory it is shown that the correlation between geomagnetic disturbances and oscillations of atmospheric pressure, tested by t-Test is greater than chance in Scandinavia. The singularities appearing in the annual course of atmospheric pressure are attributed to harmonic oscillations related to fixed calendar dates; the reality of these singularities is likewise statistically significant. The pressure oscillations are regarded as caused by variations in solar activity that occur at fixed dates and the mechanism of this action is excessive ultraviolet radiation. *Subject Headings:* **1. Pressure oscillations 2. Singularities 3. Solar influences 4. Magnetic disturbances 5. Ultraviolet radiation 6. Scandinavia.**—*I.L.D.*

## VISIBILITY

*See also:* **Fog investigations** (Stewart), 4.11–29; **Reading as measurement of brightness** (Scheer), **4.11–142.**

4.11–268 551.591.1:551.574.1:551.576.1

Best, A. C., **A modified form of Trabert's formula.** *Journal of Meteorology*, 10(3):227–228, June **1953.** table, 5 refs., 5 eqs. **MH-BH**—BEST obtains $WV=\frac{3.9\times 2b}{3\Gamma(1/n)}$; $W$ = liquid water content, $V$ = visibility, $b$ and $n$ govern drop size spectrum. The constants are discussed and values of TRABERT's constant given in terms of drop size distribution and "mean radius" (by 3 definitions). (*See also* item 3I-227, Sept. 1952, *MAB.*) *Subject Headings:* **1. Visibility 2. Water content of clouds.**—*C.E.P.B.*

4.11–269 551.591.361(26)

Markgraf, H., **Aussergewöhnliche Feuersichtung an Bord des Feuerschiffs "S 2."** [Exceptional visibility of lights on the Lightship "S 2."] *Seewart*, Hamburg, 14(2):11–16, April **1953.** Mimeo. **DLC**—On Sept. 14, 1952, from 54°N., 3°32'E., 0–2 h, lights to SE were seen reflected by overcast sky, probably from lightships 80–100 sea miles distant. Cause considered to be connected with an inversion of 4–6°C at about 2000 m with rapid decrease of humidity upwards, in subsiding cold air. *Subject Headings:* **1. Exceptional visibility 2. North Atlantic.**—*C.E.P.B.*

## OPTICAL PHENOMENA

*See also:* **Sky color** (Bullrich, de Bary, Möller), 4.11-5; **Atmos. turbulence and starlight scintillation** (Gifford, Mikesell), 4.11–178.

4.11–270 551.593.5:551.574.1

Elsaesser, Martin S. and Wirtz, Karl, **Winkelabhängigkeit der Lichtstreuung einzelner Nebeltropfchen. (Gemessen an Mesonenbahnen der kosmischen Strahlung in der Wilson-Kammer.)** [Dependence of the light scattering of single fog droplets on the angle (measured on meson tracks of cosmic radiation in a Wilson chamber).] *Zeitschrift für angewandte Physik*, 5(4):133–139, **1953.** 6 figs., 3 tables, 15 refs., 11 eqs. **MH-BH**—Light scatter of droplets of an alcohol-water mixture formed by fast cosmic ray particles in a cloud chamber and illuminated from the side was photographed from different angles. Results:

| Angle of scatter, degrees | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|
| Relative light intensity | 1.46 | 1. | 0.52 | 0.27 | 0.20 |

Results are compared graphically with those of other investigators. They do not agree well with the theoretical curve of C. WIENER (1907). *Subject Heading:* **1. Scattering of light.**—*C.E.P.B.*

4.11–271 551.593.55

Koomen, M. J., Lock, C., Packer, D. M., Scolnik, R., Tousey, R. and Hulburt, E. O., **Measurements of the brightness of the twilight sky.** *Optical Society of America, Journal,* 42(5):353–356, May **1952.** 3 figs., 3 tables, 2 eqs. **DWB**—With a recording phonometer of photopic sensitivity, measurements were made of many points in the sky during twilight for solar altitudes $H = +5°$ to $-15°$ for clear air and no clouds at two stations, one in Maryland, altitude 30 m, and one on Sacramento Peak, New Mexico, altitude 2800 m. The sky polarization on the meridian through the sun, and the illumination on a plane at various orientations exposed to the sky, were also recorded. For $H$ from about $-3°$ to 11° the entire sky changed in brightness at about the same rate of a factor of 10 for each 2° change in $H$. Except at the horizon the Sacramento Peak sky was about $\frac{2}{3}$ to $\frac{1}{2}$ as bright as Maryland sky because of clearer air; at the horizon the two were about the same. At Sacramento Peak the ratio of the polarized components reached a minimum of about 0.06 at the zenith for $H = -3°$. *Subject Headings:* **1. Twilight sky brightness measurements 2. Maryland 3. Sacramento Peak, New Mexico.**—*Authors' abstract.*

4.11–272 551.593.7

Hammad, A. (*Cairo Univ., Egypt*), **Calculation of the polarization of a sunlit sky composed of pure air molecules.** *Optical Society of America, Journal,* 43(3):184–187, March **1953.** 2 figs., 2 tables, refs. **DWB**—In this paper, an exact solution of the complex and difficult problem of the illumination of the atmosphere and ground by sunlight is discussed in the light of numerical results. Full account is taken of the polarization of radiation by scattering, and allowance is made for the optical anisotropy of the molecules of air. The atmosphere is supposed to be uniformly mixed and stratified in parallel planes. Predictions based on that solution are put to the test of observation. The neutral points are found to occur in the manner they are observed. The incomplete polarization of the light scattered at right angles to the incident solar beam is fully accounted for, assuming a depolarization factor equal to 0.0415 for the molecules of air. Solutions taking no consideration of that factor fail to account for the observed depolarization. The observations of TIKHANOVSKIĬ on the degree of polarization of zenith scattered light are also accounted for when the optical anisotropy of the molecules of air is taken into consideration. *Subject Headings:* **1. Neutral point 2. Polarization.**—*Author's abstract.*

4.11–273 551.593.7

Lange, O., **Neue theoretische Werte für die Polarisationsgrösse, p.** [New theoretical values for the polarization magnitude p.] *Zeitschrift für Meteorologie,* 6(11):339–344, Nov. **1952.** 5 figs., 16 refs. **MH-BH**—It was found that in Tikhanovskiĭ's formula for the polarization magnitude of the light of the sky the factor $\frac{6-7a}{6}$ was missing in the numerator and denominator. The integral functions A, B, C were recalculated with the aid of the Gauss approximation method since their value was in doubt. In view of the fact that the polarization magnitude depends upon the wave length of light and that in Gotha measurements are made not only by direct observation but also with the Jena color and filter lenses RG 2 and BG 12 (each 2 mm thick), the wave lengths, $\lambda$, used as a basis were those to which the eye has a maximum sensitivity, namely, 555, 630 and 465 m$\mu$. The polarization values obtained by the formula for different solar elevations are given for these wave lengths graphically and tabularly. *Subject Headings:* **1. Polarization 2. Jena interference filter.**—*I.L.D.*

4.11–274 551.593.7:551.501

Wöhlisch, Edgar, **Ein Kunstgriff zur unmittelbaren Erkennung der Polarisation des Himmelslichtes.** [A technique for the immediate recognition of sky light polarization.] *Naturwissenschaften,* 40(8):238, April **1953.** **DWB**—In polarized skylight some people see a "bruch"

of 2 yellow and 2 blue spots around the axis of vision. This is facilitated by turning head rapidly through 70° from side to side, or by reflecting the sky in an oscillating metal mirror. *Subject Headings:* **1. Polarization 2. Observation techniques.**—*C.E.P.B.*

## ELECTRICAL PHENOMENA

*See also:* **Ionization and recombination in upper atmos.** (Bates), 4.11-97; **Determination of collision frequency of electrons in ionosphere** (Briggs), 4.11-99; **F ionization in the morning** (Burkard, Malinger, Schwarz), 4.11-101; **Modification of rain with distance fallen** (Rigby, Marshall), 4.11-226.

4.11–275 551.594:523.78

Dauvillier, Alexandre, **Observation du champ eléctrique atmosphérique à Khartoum durant l'éclipse totale de soleil du 25 février 1952.** [Observations of the atmospheric electric field at Khartoum during the total eclipse of Feb. 25, 1952.] *Académie des Sciences, Paris, Comptes Rendus,* 235(16):852–854, Oct. 16, **1952. DWB**—SUCKSDORF observed a strong (50%) decrease in the electric field of the atmosphere during the eclipse at Kokkola, Finland, on July 9, 1945 in clear weather. Contrary results were noted by CHAUVEAU on April 17, 1912 at Paris—no effect being noted at all. The present note indicates that no effect was produced by the total eclipse of the sun at Khartoum on Feb. 25, 1952. At Gods Lake on Hudson's Bay an increase was noted during eclipse at July 9, 1945 and on May 20, 1947 an increase was noted in Brazil. All variations shown by records of Feb. 25 can be attributed to other elements such as sandstorms as evident from daily variations in other days (Feb. 19–28 1952). *Subject Headings:* **1. Atmospheric electricity 2. Solar eclipses 3. Khartoum, Sudan.**—*M.R.*

4.11–276 551.594

McDonald, James, E., **The earth's electricity.** *Scientific American,* 188(4):32–37, April **1953.** illus. **DWB**—"The earth is charged in respect to the atmosphere and the atmosphere is sufficiently ionized to be a conductor. How, then, is the earth capable of maintaining its charge?" The author reviews the theories seeking an answer to this problem first raised by the German physicist F. LINNS in 1887. He believes that the explanation suggested by C. T. R. WILSON in 1920 can be maintained despite arguments raised against it by some investigators. According to the WILSON hypothesis, negative charges supplied to the earth in thunderstorm regions are sufficient to counterbalance the neutralizing effect of positive charges which the earth receives from the atmosphere in storm-free areas. Recent measurements in flight appear to have supplied no evidence which would refute this theory. *Subject Headings.* **1. Atmospheric electricity. I. Wilson, C. T. R.**—*G.T.*

4.11–277 551.594.11(547)

Sivaramakrishnan, M. V. (*Solar Physics Obs., Kodaikanal*), **Changes of atmospheric electric potential gradient at Poona during disturbed weather.** *Indian Journal of Meteorology and Geophysics,* 4(1):62–75, Jan. **1953.** 15 figs., 4 tables, 20 refs. **MH-BH**—A detailed study of the changes of atmospheric potential gradient during disturbed weather at Poona for 5 years 1936–40 has been made. From the analysis it is seen that if during rainfall the potential gradient is negative but without rapid variations the rainfall is associated with a quiet atmosphere, whereas large and rapid changes in the potential gradient are usually associated with atmospheric disturbances having appreciable local ascending air currents just as the rainfall occurring in showers. Changes in potential gradient are not closely associated with either the intensity or the variations of the rainfall. The field at the ground is not essentially different in thunderstorms from that associated with showers. Two main types of potential gradient patterns have been recognised, (*a*) Wave Patterns (*b*) Symmetrical Patterns. Some of the patterns are seen to be associated with definite types of weather. *Subject Headings:* **1. Atmospheric potential gradient 2. Poona, India.** —*Author's abstract.*

4.11–278 551.594.21:06

Conference on Thunderstorm Electricity, Chicago 1950, **Report on Conference, Chicago pril 10–14, 1950.** Chicago, University. Dept. of Meteorology, Contract No. AF 19(122)-94, Oct. **1950.** 359 p. figs., tables, 30 refs. **DWB**—Byers, Horace R. and Braham, oscoe R., Jr: "The structure and dynamics of the thunderstorm," p. 3–27; Workman, E. J. id Reynolds, S. E.: "Thunderstorm research program at the New Mexico School of Mines," 31–47; Weickmann, Helmut: "The problem of the formation of precipitation," p. 51–95; uettner, Joachim: "Charge distribution in a thunderstorm," p. 99–107; Loeb, Leonard B.: Contributions to the thunderstorm electrification conference from the University of Cali-rnia at Berkeley," p. 111–127; Gunn, Ross: "Thunderstorm electricity," p. 131–147; Chap-an, Seville: "Hydrometeors and thunderstorm electricity," p. 151–169; Gish, O. H.: "Prob-ms of atmospheric electricity," p. 173–189; Wait, George R.: "Electric charge carried to round through thunderstorms," p. 193–205; Norinder, Harald: "The effect of geological equalities," p. 209–215; Holzer, R. E.: "Thunderstorms and sferics," p. 219–229; Norinder, arald: "Lightning as an electromagnetic phenomenon," p. 231–247; Newman, Morris M.: Lightning atmospherics transients investigation," p. 251–275; Harder, E. L. and Clayton, M.: "Power line protection," p. 279–291; Norinder, Harald: "Lightning protection for uildings," p. 295–299; Newman, Morris M.: "Aircraft phases with respect to lightning rotection," p. 303–317; Byers, Horace R.; Workman, E. J.; Newman, Morris M. and other articipants: "Suggestions and plans for future work," p. 321–353. *Subject Headings:* **Thunderstorm electricity 2. Conferences. I. Contract AF 19(122)-194 II. Chicago. niversity. Dept. of Meteorology.**

4.11–279 551.594.22

Malan, D. J. (*Johannesburg Univ.*), **Les décharges dans l'air et la charge inférieure ositive d'un nuage orageux.** [Atmospheric discharges and the positive charge in the base a thundercloud.] *Annales de Géophysique,* 8(4):385–401, Oct./Dec. **1952.** 3 figs., 2 tables, 5 refs. English summary p. 385. **MH-BH**—New photographic and electrical observations onfirm the frequent existence of pockets of positive charge in the base of a thundercloud. statistical analysis of the electrical fields has shown that the average value of the lower ositive charge is about 10 coulombs, the charges higher up in the cloud being −40 and +40 oulombs. It is concluded that the space charge originating from point-discharge is distributed a fairly thin blanket-layer near the ground, except at the frontal boundary of the region of recipitation. Here the space charge is distributed in the shape of a pyramid whose point eaches the cloud. The updraft will deposit positive charges on the cloud base, which, together ith previous positive charge, will occasionally trigger a lightning flash. The whole electrical rocess resembles a relaxation oscillation of fairly constant initial conditions but of widely arying amplitude and period. *Subject Headings:* **1. Thunderstorm electricity 2. Electrical ischarges.**—*Author's abstract.*

4.11–280 551.594.22:77

Sourdillon, Marc, **Étude à la chambre de Boys de "l'éclair dans l'air" et du "coup de oudre à cime horizontale."** [Study of "lightning from cloud to air" and of "strokes from oud to ground with horizontal tops" by means of a Boys camera.] *Annales de Géophysique,* (4):349–354, Oct./Dec. **1952.** 3 figs., 9 refs., 15 plates. English summary p. 349. **MH-BH** -Lightning photographs are presented, discussed and analyzed in diagrams. The pictures ere obtained with a Boys camera. The author indicates the shortcomings inherent in hotographic recording of lightning and explains how they affect the evaluation of lightning hotographs. A French-English vocabulary consisting of names of 12 different types of ghtning is offered. *Subject Headings:* **1. Lightning photography 2. Lightning terminology.** *-G.T.*

4.11–281 551.594.221

Iurlov, S. N., **Chetochnaia molniia v g. Votkinske.** [Beaded lightning in Votkinsk.] *riroda,* Moscow, 40(12):44, Dec. **1951. DLC**—The beaded lightning was observed on June 3, 1951 between 1835 and 2130 hours (I.M.S.T.) at Votkinsk in the Udmurt ASSR. It

appeared as a curved beaded string and it broke up into numerous spheres which disappeare in different directions and became extinguished like rockets. *Subject Headings:* **1. Bea lightning 2. Votkinsk, U.S.S.R.**—*I.L.D.*

4.11–282 551.594.223(49

Thate, J. B., **Bolbliksem te Warnsveld op 28 November 1951.** [Ball lightning at Warn veld on 28 Nov. 1951.] *Hemel en Dampkring*, 50(7/8):134–135, **1952.** 2 figs. **MH-BH**— description of the damage caused to houses in the vicinity of the explosion caused by ba lightning which struck a tree and then traveled some distance along the ground. The ba lightning was reported by observers to have been as large as a thumbnail, seen at arm's lengt distance; it traveled from the clouds followed by a stream of light, and was surrounded b lightning-like extensions. *Subject Headings:* **1. Ball lightning 2. Warnsveld, Netherlands.**- *I.L.D.*

## RADIO PROPAGATION

4.11–283 551.594.6:621.396

Sullivan, A. W., VanValkenburg, H. M. and Barney, J. M., **Low-frequency atmospher radio noise in Florida.** *American Geophysical Union, Transactions*, Pt. 1, 33(5):650–65 Oct. **1952.** 11 figs. **MH-BH**—This study of diurnal and seasonal variations in averag noise level and frequency spectra is based on the data of 15, 52, 189 and 530 Kc frequenci obtained since 1947, eight miles from Gainesville, Florida, where man-made noise is at a mi mum and the noise levels are quite high from March to Sept. The use of 23 m high antenn enables reception of noise from any azimuth on the Signal Corps BC969 and the BC779 receive employed. The results show: 1) that noise levels are almost inversely proportional to fr quency in the 10–500 Kc range and 2) the possibility that the average noise spectrum is consta at the source of the noise; hence, if this is true, atmospheric noise will prove valuable as a to in studies of propagation. 3) Diurnal and seasonal variation in noise intensity depends frequency and propagation conditions. 4) SID generally tend to cause an increase of nois *Subject Headings:* **1. Radio noise 2. Long wave propagation 3. Gainesville, Florida.**—*W.*

4.11–284 551.594.7:621.396(43

Abild, V.; Wensien, H.; Arnold, E. and Schikorski, W. (*Aerologische Station Flensbu NW Germany*), **Über die Ausbreitung ultrakurzer Wellen jenseits des Horizontes unt besonderer Berücksichtigung der meteorologischen Einwirkungen.** [On the propagati of ultrashort waves beyond the horizon with special consideration of meteorological influences *Hamburg. Nordwestdeutscher Rundfunk, Technische Hausmitteilungen*, 4(5/6):85–100, Ma June **1952.** 25 figs., 7 tables, 7 refs., 43 eqs. Abstracted from reprint. **DWB**—After detailed theoretical analysis of ultrashort-wave propagation, in which the effect of vario conditions in the deflection and the interference zones is investigated and illustrated by num ous diagrams, tables and graphs, the authors report field intensity measurements conduct in NW Germany. General conclusions are deduced from observed high field intensities a corresponding synoptic situations. Data on the correlation between field intensities a height and thickness of inversions, pressure, and temp., are presented. Seasonal variations inversions, of anomalous field intensities, etc., are shown in tables and graphs. The auth conclude that both ground-level inversions and those above 3,000 m increase field intensiti A few situations in which the effect of inversions was particularly noticeable are describ *Subject Headings:* **1. Ultrashort wave propagation 2. Inversions 3. Correlations 4. Nort west Germany.**—*G.T.*

4.11–285 551.594

**Abnormal radar propagation. North Atlantic Ocean.** *Marine Observer*, 23(161):147–1 July **1953. MH-BH**—July 24, 1952, O.W.S., 58°58'N., 19°15'W., land echoes observed long pulse radar, indicated at 92–100 mi. Due to second trace echoes from Iceland, 260 distant. Radiosonde showed a temperature inversion at 986 mb. *Subject Heading:* **1. Rad meteorology.**—*C.E.P.B.*

4.11–286 551.594.7:621.396.029.6

†Marshall, John Stewart; East, T. W. R. and Gunn, K. L. S., **Microwave properties of precipitation particles.** McGill University. Macdonald Physics Laboratory. Stormy Weather Research Group, Contract AF 19(122)-217, Scientific Report MW-7, July **1952.** 0 p. figs., table, refs. p. 39–40, eqs. **DWB**—This study goes in some detail into the effect of shape and composition of the various precipitation particles. Not only is the sphere, in the steps ranging from: 1) all ice, to 2) ice coated with water and into 3) all water, discussed but also assemblies of spheres, rain, nonspherical and coated particles (flakes and crystals) are considered. The results are discussed and the data are presented in tables and curves featuring individual and comparative values. Further experiments as to the problem of the "bright band" are suggested. *Subject Headings:* **1. Microwave propagation 2. Precipitation 3. Bright band echoes. I. Contract AF 19(122)-217 II. McGill University Macdonald Physics Laboratory. Stormy Weather Research Group.**—*W.N.*

4.11–287 551.594.7:621.396.8

Poeverlein, H., **Ionosphären-Grenzfrequenz bei schiefem Einfall.** [Ionosphere critical frequency at oblique incidence.] *Zeitschrift für angewandte Physik*, 5(1):15–19, **1953.** 4 figs., 25 refs., 12 eqs. **DLC**—A method of constructing paths of radio waves in the ionosphere which takes account of the earth's magnetic field is applied to calculate the critical frequency for any angle of incidence. Graphs show for waves of 3.75 MHz the ratios of critical frequency for vertical incidence to incidence at any angle, ratio for waves in E-W plane to those in magnetic meridian, and effect of wave length (7.5–0.75 MHz). *Subject Heading:* **1. Radio transmission.** —*C.E.P.B.*

## ACOUSTICAL PHENOMENA

*See also:* **Internal and kinetic energy currents in atmos.** (Čadež), 4.11–105.

4.11–288 551.596:534:629.13

Lilley, G. M., Westley, R., Yates, A. H. and Busing, J. R., **The supersonic band.** *Nature*, London, 171(4362):994–996, June 6, **1953.** 8 figs., 4 refs. **DWB**—The double (occasionally triple) bang heard when an airplane passes through the sound barrier is explained by consideration of movements of bow and tail waves relative to the plane at different Mach numbers. *Subject Heading:* **1. Shock waves.**—*C.E.P.B.*

4.11–289 551.596.1:551.551

Kharanen, V. IA., **O rasprostranenii zvuka v srede so sluchaĭnymi fluktuatsiiami pokazatelia prelomleniia.** [Sound propagation in an environment of random fluctuations of refractive index.] *Akademiia Nauk, SSSR, Doklady*, 88(2):253–256, **1953.** 4 refs., 13 eqs. **DLC**—Theoretical study of sound propagation, assuming that refractive index is a continuous steady random function of coordinates with macroscopic isotropy. Mean statistical characteristics derived considering autocorrelation and assuming that the random processes are of the type of MARKOV chains. Study made originally for sound propagation in the surface layer of the sea with a thermocline, where under certain conditions the sound does not reach the surface. In order to use the solution the scale of turbulence computed from the autocorrelation function must be known. *Subject Headings:* **1. Acoustical propagation 2. Turbulence effects.**—*A.A.*

# PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON THUNDERSTORM SFERICS

By: *Wilhelm Nupen, Malcolm Rigby,* and *Katherine Martinoff*

## INTRODUCTORY NOTE

The study of sferics, or radio atmospherics, and their meteorological relationships has led to a great number of practical applications as well as to a number of new scientific discoveries regarding the upper atmosphere, electromagnetic propagation, etc. After the invention of the lightning recorder by POPOV in 1895–6, developments in radio propagation and receiving were very rapid for a few years, even to the discovery of the ionospheric reflection by HEAVISIDE in 1900—which discovery was denied by himself for a dozen years in favor of an alternative and seemingly more logical explanation of long distance propagation.

In a similar manner the fact that atmospherics could be obtained from many other sources (besides lightning), held back developments in radiogoniometry of thunderstorm atmospherics in the U.S.A. and in Germany for over 10 years (1910–1920) when new impetus was given to this approach by the work of WATSON-WATT, BUREAU, LUGEON, etc.

During the past 10 years, interest in this field has become so intense and widespread that conferences on sferics research, development and applications are being held nearly every year.

The recent substitution of the word *sferics* for *atmospherics* (as recommended by the I.M.O. in 1947) has led to some confusion as to terminology since the two words were not intended to be synonymous. The definitions provided by the 1953 sferics conference at Zurich (item 4K–275) make it preferable to use *atmospheric(s)* for a single or a group of electromagnetic impulses coming from a lightning stroke or other electric discharge, and *sferics* for the general subject of radio atmospherics, for instrumental or other types of research or development, for areas of general activity and for meteorological relationships.

If we have not always adhered strictly to the above definitions it is because the distinction is not always perfectly clear in the article itself. In the subject index the entire range of subject matter has been referred to *sferics* since it is usually a *subject area* or concept that is under consideration, not a clearcut *meteorological phenomenon.* Furthermore, this allows us to group together in the index most of the material in this field.

The following outline gives an idea of the wide variety of aspects covered in such a narrow field. In fact, time and space limitations required that the scope of the bibliography be limited to the sole topic of *atmospherics from thunderstorms,* leaving out all but a very few references to articles on lightning or thunderstorm charges and fields; cloud, rain, snow or other forms of radio static, solar or galactic radio "noise," etc. Where the source was unknown but *could* have been from lightning discharges which were not observed (i.e., from cyclones, fronts, CuNb clouds or mountain areas) the items *have* been included since they apply to the general problem of forecasting *weather from sferics* or of forecasting the *occurrence of atmospherics for radio propagation* (two widely different applications which, however, are closely interrelated).

Since numerous papers by prolific writers such as LUGEON, BUREAU, NORINDER, ISRAËL and others have been omitted, the reader who wishes a more exhaustive coverage of the field should consult extensive bibliographies contained in items: 4K–53, 4K–78, 4K–117, 4K–141, 4K–247 and 4K–275 and other items marked with a dagger (†).

For further material on thunderstorm electricity or lightning the reader may consult the text book **Das Gewitter,** by H. ISRAËL, item 4K-218 (431 refs.); **The Flight of Thunderbolts,** by B. F. J. SCHONLAND (4K–228) or **Atmospheric Electricity,** by J. ALAN CHALMERS, Vol. 1, No. 6, item 6–103 June 1950, *MAB* (248 refs.) and other references in the **Thunderstorm Bibliography,** Vol. 1, No. 8 Aug. 1950, *MAB.* The entire subject of Thunderstorm Electricity, *per se* has, however, been reserved for a future bibliography.

We wish to express appreciation for the assistance rendered by Mr. Jean Lugeon of Zürich, H. Israël of Bonn, and G. J. Evans of Harrow, England, in going over our preliminary lists and making suggestions for further additions.

# SUBJECT OUTLINE


GENERAL AND THEORETICAL STUDIES
**General,** 4K–5, –62, –108, –117, –121, –203, –274
Bibliographies, 4K–53, –59, –78, –86, –117, –141
Conferences, 4K–275
History, 4K–62, –78, –194, –229, –271
Research, 4K–21, –24, –30, –42, –43, –57, –62, –70, –88, –104, –111, –113, –114, –116, –122, –150, –151, –157, –158, –194, –224, –241, –270, –280, –283, –285, –286
Research in Arctic, 4K–96, –122
Progress in sferics recording, 4K–177
Laboratory experiments, 4K–226
Statistical studies, 4K–215, –246
Symposia, 4K–272, –275
Textbooks, 4K–39, –228, –271
**Sferics classification,** 4K–29, –30, –44, –45, –52, –62, –73, –245, –280
Codes, 4K–194, –224, –242, –254, –256, –278, –290
Scales, 4K–21, –150
**Sferics theory,** 4K–9, –19, –32, –36, –45, –47, –49, –79, –103, –118, –132, –172, –198, –202, –208, –210, –249, –261, –264
Wind shear theory, 4K–45
**Sferics networks,** 4K–41, –62, –72, –111, –149 to –151, –166, –194, –208, –222, –224, –255, –267, –275, –281, –283 to –285
SFERICS CHARACTERISTICS
**Energy,** 4K–173, –287, –289
**Intensity,** 4K–27, –65, –68, –92, –126, –154, –231
**Propagation,** 4K–57, –198, –231
**Pulse duration,** 4K–104, –167, –262
**Propagation range**
Sferics from local sources, 4K–128, –135
Sferics from distant sources, 4K–57, –67, –83, –102, –128, –232, –255
**Reflections,** 4K–9, –12, –91, –103, –137, –162, –173, –188, –245, –265
**Structure,** 4K–112
**Types,** 4K–14, –50, –73, –110, –128, –204, –254
**Wave forms,** 4K–14, –22, –30, –36, –42, –44, –56, –68, –82, –118, –128, –137, –139, –142, –146, –155, –159, –164, –167, –168, –180, –182, –201, –207, –235, –241, –244, –245, –247, –249, –256, –258, –265, –269, –280, –286
**Long wave sferics,** 4K–81, –90, –124, –161, –231
**Short wave sferics,** 4K–87, –161, –288
SFERICS ORIGIN, 4K–5, –23, –42, –46, –92, –113, –202, –209, –261
**Sources,** 4K–16, –61, –80, –98, –105, –116, –117, –126, –129, –133, –141, –148, –152, –161, –163, –165, –174, –202, –214, –216, –263, –264, –266, –278
Air masses, 4K–33, –64, –117, –184, –263
Polar air masses, 4K–31, –32, –34
Fronts, 4K–33, –34, –53, –60, –105, –148, –174, –183, –184, –214, –263
Thunderstorms, 4K–11, –22, –37, –48, –55, –56, –67, –93, –126, –129, –132, –133, –136, –144, –148, –159, –161, –170, –173, –178, –181, –212, –214, –216, –218, –220, –243, –246, –255, –257, –270
Thunderclouds, 4K–25, –67, –136, –156, –256, –261, –270
Lightning, 4K–7, –11, –13, –37, –44, –56, –77, –94, –97, –106, –113, –119, –120, –127 to –129, –152, –168, –195, –200, –211, –217, –223, –226 to –228, –230, –239, –241, –248, –250, –252, –254, –262, –265, –268 to –270, –273 –293
Clouds, 4K–11, –261
Precipitation, 4K–123, –206, –293
Rainfall, 4K–23, –24, –105, –123, –165
Snow, 4K–105, –123, –210
Cyclonic storms
Cyclones, 4K–72, –105
Hurricanes, 4K–15, –131, –220
Hurricane centers, 4K–172
Typhoons, 4K–105, –236, –262, –264, –270, –292
Typhoon centers, 4K–58, –292
Tornadoes, 4K–211, –219, –234, –247, –288
Ionosphere, 4K–161, –212
Mountains, 4K–35, –40
**Sferics reflections from ionosphere,** 4K–9, –12, –91, –103, –137, –162, –164, –188, –245, –265
**Sferics during eclipse,** 4K–91
**Sferics during monsoon,** 4K–178, –179
OBSERVATIONS AND INSTRUMENTS
**Equipment** (instruments), 4K–96, –111, –114, –118, –122, –160, –177, –222, –234, –271, –281
Detectors, 4K–2
Branly coherers, 4K–1, –6
Radiophones, 4K–2
Recorders, 4K–1 to –4, –6, –8, –10, –13, –30, –62 to –64, –100, –115, –117, –125, –130, –145, –147, –158, –168, –169, –176, –195, –208, –238, –269, –282
Atmoradiographs, 4K–76, –85, –96, –111
Direction recorders, 4K–27, –84, –130
Lightning recorders (ceraunometers), 4K–230, –277, –282
Long wave recorders, 4K–90
Photographic recorders, 4K–8, –10, –138
Boys camera, 4K–152, –256
Radiogoniographs, 4K–158
Radiomaxigraphs, 4K–147
Wave form recorders, 4K–138, –140, –146, –155, –235, –251, –259
Cathode-ray oscillographs, 4K–29, –54, –74, –106, –136, –140, –146, –182, –204, –256, –265
Oscillograph records (oscillograms), 4K–127, –207, –210, –234, –251
Sferics records, 4K–135, –143
Sferics recorder calibration, 4K–289

Direction finders, 4K–16, –18, –74, –109, –258, –260, –262
Cathode-ray direction finders, 4K–115, –199, –282
Direction recorders, 4K–27, –84, –130, –158
Radiogoniometers, 4K–16, –20, –84, –89, –131, –143, –185, –240, –278
Direction finding accuracy, 4K–143
Sferics on radar, 4K–189, –190, –193, –197, –199, –205, –211, –213, –219, –220, –221, –223, –248, –268, –293
**Sferics recording methods,** 4K–41, –160, –170, –214, –281
Aural, 4K–62
Automatic, 4K–62
Photographic, 4K–6, –8, –10, –38, –138, –152, –170, –244, –245, –259, –260, –269
**Methods of observations,** 4K–126, –149, –266, –276
Balloon investigation, 4K–11
Atmoradiograph soundings, 4K–76
Detection by radar, 4K–190
Sferics location, 4K–9, –110, –183, –266
Single station sferics location, 4K–283
Sferics map analysis, 4K–276
Sferics source location, 4K–102, –165, –222
Graphical method, 4K–102, –276
Triangulation, 4K–209
Radiogoniometry, 4K–26, –54, –114, –183, –191
Telephone method, 4K–55
**Measurement techniques,** 4K–52, –154, –165, –182, –210
Laboratory experiments, 4K–226
Statistical techniques, 4K–246
SFERICS DATA, 4K–13, –29, –44, –46, –52, –57, –98, –105, –117, –122, –126, –129, –141, –142, –154, –169, –266, –292
**Sferics variations,** 4K–5, –12, –215, –280
Diurnal, 4K–2, –9, –27, –49, –53, –62, –66, –68, –69, –92, –93, –99, –101, –128, –133, –143, –175, –179, –186, –214, –216, –225
Seasonal, 4K–62, –66, –68, –92, –99, –133, –166, –179, –186, –216, –222
**Sferics direction data,** 4K–23, –28, –92, –291
**Sferics distribution,** 4K–17, –50, –186, –202, –263
Sferics source distribution, 4K–124, –126, –153, –163, –166, –215, –222, –236
Sferics directional distribution, 4K–74, –109, –172, –208, –222
Geographical distribution, 4K–186, –215, –280
Sferics over oceans, 4K–72, –215, –263
Sferics in polar regions, 4K–69, –99, –103, –108
Sferics in tropics, 4K–14
**Sferics frequencies,** 4K–37, –101, –236
Sferics frequency distribution, 4K–93
Sferics periodicity, 4K–184
MISCELLANEOUS INFLUENCES ON SFERICS
**Geomagnetic effects,** 4K–237
**Orographic effects,** 4K–40
Mountain effects, 4K–31, –33, –34
**Sirocco effects,** 4K–5
**Solar influences,** 4K–27, –31, –55
**Temperature effects,** 4K–55
**Twilight effects,** 4K–9, –71, –169, –192
FORECASTING ATMOSPHERICS, 4K–51, –59
APPLICATIONS
**Detection of tropospheric disturbances,** 4K–160, –189, –196, –220, –240
Location of fronts, 4K–65, –286
Thunderstorm detection, 4K–1, –2, –4, –17, –24, –89, –115, –129, –157, –166, –175 to –177, –183, –185, –225, –240, –243, –249, –295
Lightning detection, 4K–195
Thunderstorm location, 4K–187, –192, –208, –235, –252, –271
Tornado detection, 4K–211, –219, –234, –247
Typhoon location, 4K–286
Hurricane detection, 4K–131
Jet stream location, 4K–263, –264, –286
Tropopause location, 4K–83
**Weather forecasting from sferics,** 4K–26, –51 –59, –61, –71, –72, –111, –183, –224, –225
Temperature forecasting, 4K–291
Thunderstorm forecasting, 4K–3, –8, –10 –18, –43, –75, –100, –110, –145, –158, –175, –181, –240, –279
Thunderstorm warning, 4K–195
Hurricane forecasting, 4K–15, –107, –225
**Research on atmospheric structure,** 4K–76
Stratospheric structure, 4K–21
Ozone layer, 4K–83
Ionosphere, 4K–76, –85
Ionospheric height determination, 4K–83 –286
E layer, 4K–83
**Aviation,** 4K–15, –116, –123, –139
**Marine navigation,** 4K–17, –78

## GEOGRAPHICAL OUTLINE

SOUTHERN HEMISPHERE, 4K–153
POLAR REGIONS, 4K–69
**Arctic,** 4K–108, –133
Bear Island, 4K–96, –103, –122
Franz Joseph Land, 4K–133
NORTH AMERICA, 4K–216
**Alaska,** 4K–35
**Canada,** 4K–109
**Greenland**
Scoresby Sound, 4K–99
**United States,** 4K–16, –93, –246, –247
Florida
Pensacola, 4K–15
Maine
Houlton, 4K–61, –72, –74

Oklahoma
Stillwater, 4K–288
Pacific Northwest, 4K–35
**Canal Zone,** 4K–46
EUROPE, 4K–101, –154
**Alps,** 4K–65
**Austria,** 4K–73
Sonnblick, 4K–73, –82
**France,** 4K–183
Lyons, 4K–10
Paris, 4K–143
Puy-de-Dôme Observatory, 4K–6, –8
Strasbourg, 4K–20
**Germany,** 4K–161, –183, –212
Lindenberg, 4K–49
Potsdam, 4K–27, –66
Upper Rhine, 4K–21
**Great Britain,** 4K–54, –283
British Isles, 4K–186
England, 4K–80, –280
Cambridge, 4K–245
Somerset East, 4K–67
Southern England, 4K–175
Scotland
Lerwick, 4K–237
**Hungary,** 4K–4
**Italy,** 4K–52, –62, –149, –151
Catania, Sicily, 4K–3
Intra, Lake Maggiore, 4K–2
Montecasino Observatory, 4K–150
Northern Italy, 4K–230
**Poland**
Jabłonna, 4K–91, –122, –291
**Sweden,** 4K–227
**Switzerland,** 4K–40
Zurich, 4K–41, –64, –75, –147, –158, –275, –276
**U.S.S.R.,** 4K–229
Leningrad, 4K–1, –157
Slutsk, 4K–101, –157
**Western Europe,** 4K–215, –240
ASIA
**China**
Shanghai, 4K–292
**Far East,** 4K–222
**India,** 4K–154, –178, –179
Bangalore, 4K–98
Calcutta, 4K–134, –155
Dacca, 4K–207
Madras, 4K–128
**Japan,** 4K–81, –106, –256, –258 to –265, –270
Nagoya, 4K–286
**Mongolia,** 4K–263
**Netherlands Indies,** 4K–14
**Tibet,** 4K–273
**Turkistan,** 4K–273
AFRICA, 4K–113, –153
**Morocco**
Fédale, 4K–285
Rabat, 4K–278, –285
**South Africa,** 4K–129, –166, –231
**Southern Rhodesia**
Bulawayo, 4K–282
**Sudan,** 4K–284
**West Africa**
Darav, 4K–50
AUSTRALASIA
**Australia,** 4K–92, –126, –130, –163
Canberra, 4K–124, –125
Southern Australia, 4K–116
Tasman Sea, 4K–115
Western Australia
Watheroo, 4K–56
OCEANS, SEAS AND ISLANDS, 4K–69
**Atlantic Ocean**
North Atlantic, 4K–174, –215
Martinique, 4K–146
Puerto Rico, 4K–16
**Mediterranean Area,** 4K–5
**Pacific Ocean**
Hawaii, 4K–47
Western Pacific Ocean, 4K–236, –264

# BIBLIOGRAPHY ON THUNDERSTORM SFERICS

## 1896

**4K–1** 551.508.94

Popov, A. S., **Pribor dlia obnaruzheniia i registrirovaniia elektricheskikh kolebanii.** [Instrument for detecting and registering electric oscillations.] *Russkoe Fiziko-Khimicheskoe Obshchestvo, Leningrad, Zhurnal,* 28(1), Fizicheskiĭ Otdel, No. 1:1–14, **1896.** 2 figs., 12 refs. **DLC** QD1.R9). English summary entitled: **An application of the coherer.** *The Electrician,* London, 0(7):235, Dec. 10, **1897.** 3 figs. **DLC**—POPOV is recognized as the inventor of the first thunderorm or sferics recorder and incidentally of essentially the same receiving device as MARCONI atented in London on June 2, 1896. POPOV demonstrated his device in the laboratory at a meeting f the Russian Physico-Chemical Society in St. Petersburg on May 7, 1895, and a month later nstalled an antenna on the anemometer tower and the recording apparatus in a room of the Meteorogical Observatory of the Forest Institute in St. Petersburg. On July 30, 1895 he recorded numerous ightning flashes from a nearby thunderstorm and on Aug. 23 and 25, 1895 similar records were btained although no thunderstorm was recorded nearby. The principle of the recorder was the ohesion induced in iron filings between two platinum plates in a glass tube (Branly coherer) when eeble electric currents, such as are induced in the circuit by Hertzian waves from lightning discharges, activate the coherer, thus closing the circuit which causes a relay to produce a vertical nark on a recorder sheet mounted on a drum and at the same time activating a trembler which

"decoheres" the filings. In the letter to *The Electrician* dated Nov. 26, 1897 the author recognized the implications of his device for signalling as well as for thunderstorm warning, although MARCONI had preceded him in respect to the former by a year. *Subject Headings:* **1. Sferics recorders 2. Branly coherer 3. Sferics thunderstorm detection 4. Leningrad, U.S.S.R.**—*M.R.*

## 1900

**4K–2** 551.508.94 551.501.83:551.515

Tommasina, Th., **Sur l'étude des orages lointains par l'électroradiophone.** [Study of distant thunderstorms by electric radiophone.] *Académie des Sciences, Paris, Comptes Rendus,* 131(22):876–878, Nov. 26, **1900.** ref. Also: **Sur l'auscultation des orages lointains et sur l'étude de la variation diurne de l'électricité atmosphérique.** [On the detection of distant thunderstorms and the study of the diurnal variation of atmospheric electricity.] *Ibid.,* 133(24):1001–1003, Dec. 9, **1901.** 2 refs. **DLC**—Between 1898 and 1900 the author developed an improved carbon coherer (reported in *ibid.,* 130:904–905, April 2, 1900 and in *L'elettricità,* Milan, 19(24):370–374, June 16, 1900) which he named the electro-radiophone. In the latter article he defends his prior invention of this device over POPOV's claim (patented London, Feb. 1900) to priority, and fully describes and illustrates the principle and the equipment which he installed along with his sferics recorder at the observatory at Intra on Lake Maggiore, Italy. He was able to detect thunderstorm sferics from sources >100 km and to follow the storm's course while approaching and receding or dissipating. A vivid description of such an event on Sept. 29, 1900 is reported in the first article cited and is translated into English on p. 278 of NORINDER's article in the book "Thunderstorm electricity" (1953). The author used a 30 m horizontal antenna instead of the usual vertical antenna, and during the height of the storm he always disconnected the antenna from the equipment for safety. The longer antenna, the automatic decoherence, and the greater sensitivity of the audio receiver made it possible to detect sources much more feeble than could be done with the recorder (i.e., between marks on the record sheet), and thus to follow the progress of the storm more accurately. A bell and telephone were installed in the author's bedroom so he could follow the storms at night "without becoming deranged." In the second article (1901) the author describes observations with a 120 m antenna, giving sferics from sources in Liguria (>200 km) and on the Elbe (>400 km from Lake Maggiore). By increasing the length of the antenna to 210 m and using a carbon-bismuth coherer a device was obtained of such efficiency and sensitivity that it recorded continuously discharges of atmospheric electricity from the antenna itself, even in good weather. The author noticed a double maximum of noise in the autumn (day and night) becoming a single (night) maximum in winter. *Subject Headings:* **1. Radiophones 2. Sferics recorders 3. Diurnal sferics variations 4. Sferics thunderstorm detection 5. Intra, Lake Maggiore, Italy.**—*M.R.*

## 1902

**4K–3** 551.508.94

Boggio-Lera, E., **Sopra un apparecchio registratore delle scariche elettriche dell'atmosfera.** [A device for recording atmospheric electric discharges.] *Accademia Gioenia di Scienze Naturali, Catania, Atti,* Vol. 77, *Memoria,* No. 13, **1900.** 10 p. 3 figs. Also: **Sui miei apparecchi segnalatorie registratori di temporali.** [My device for registering and recording thunderstorms.] *Ibid.,* Vol. 78, *Memoria,* No. 17, **1901.** 14 p. 2 figs., ref. And: **Un utile modificazione del coherer per gli apparecchi segnalatori e registratori del temporali.** [A useful modification of the coherer of the device for registering and recording thunderstorms.] *Ibid.,* Vol. 79; *Memoria,* No. 12, **1902.** 5 p. 6 figs. **DLC**—In the first article the author describes the device which he constructed in 1898 and first used in Oct. and Nov. 1898 to record local and distant thunderstorms at his laboratory in Catania, Sicily. The apparatus is identical with that of POPOV although several modifications had been made by introducing 2 and then 3 relays in the circuit so that 3 degrees of intensity of signals could be recorded, thus differentiating between intense local thunderstorms, distant lightning or feeble discharges. In the second article he describes his studies aimed at determining from weather maps and bulletins for Italy, the Mediterranean, etc. the sources of the sferics he recorded so as to estimate their reliability for forecasting and the length of time before a thunderstorm (distance and speed taken into account) could be detected. He estimates that his apparatus will record storms up to 400 km. He cites detailed examples to show that the stronger the signals recorded, the greater the probability of a thunderstorm in a few hours, and if the frequency and intensity of sferics increases rapidly the storm is approaching rapidly, if slowly or if diminishing in intensity the alternatives are clear. The author also adapted his device to serve as a thunderstorm or hail warning alarm and demonstrated it at "Hail shooting" expositions at Padua in Nov. 1900 and at Rome in Feb. 1901, for which he won prizes. The third article describes modifications to his original circuits which cut down autoinduction and other weaknesses which partially destroyed the usefulness of the records when repeated discharges occurred in close succession. *Subject Headings:* **1. Sferics recorders 2. Thunderstorm forecasting from sferics 3. Catania, Sicily.**—*M.R.*

**4K–4** 551.508.94

Fenyi, J., **Sur un appareil pour l'enregistrement automatique des décharges de l'atmosphère.** [An apparatus for automatic recording of atmospheric discharges.] *Académie des Sciences, Paris, Comptes Rendus*, 134:227–228, Jan. 27, **1902. DLC.** For further details *see also ibid.*, **Gewitterregistrator.** [Thunderstorm recorder.] Kalocsa, Seewarte, Selbstverlag, **1901.** And: **Über Konstruktion und Funktion eines einfachen Gewitterregistrators.** [Construction and functioning of a simple thunderstorm recorder.] *Natur und Offenbarung*, Münster, v. 49, **1903.** Unchecked.—An automatic coherer sferics recorder was set up at the Kalocsa Observatory in Hungary in March 1900 and observations that year and in 1901 showed that all of the thunderstorms within 100 km of Kalocsa were recorded on this registering device. *Subject Headings:* **1. Sferics recorders 2. Sferics thunderstorm detection 3. Kalocsa, Hungary.**—*M.R.*

**4K–5** 551.501.83 551.515.4

Jackson, H. B., **On some phenomena affecting the transmission of electric waves over the surface of the sea and earth.** *Royal Society of London, Proceedings*, 70(462):254–272, July 8, **1902.** figs., 4 tables, ref. **DLC**—A pioneer study based on observations made from Naval vessels in the Mediterranean between 1895 and 1902. The effects of topography on radio transmission over land and sea and the reduction in distance of transmission caused by dust or salt particles in the atmosphere are first discussed. The conclusions regarding sferics are: they are more frequent in summer and autumn than in winter or spring, in mountainous regions than over open sea, in southerly than in northerly winds, in front of cyclone than in rear, with falling barometer than rising and (except for storm conditions) at 8–10 p.m. than between 9 a.m. and 1 p.m. A gale without lightning was preceded by sferics. It was noted that sferics produced signals in tape recorders similar to actual Morse code letters, so records of sferics were made possible by leaving the recorders operating. During approaching storms the radio reception distance was reduced 30–80% but during passage of sferics producing storm the reception distance would usually increase tremendously in spite of the frequent discharges. During sirocco winds the reception distance was markedly reduced. The author also noted effects such as skipping or zones of inaudibility of 20–40 mi and the remarkable fact that by using other transmission wavelengths the skipping did not occur. Thus he correctly interprets effects of lightning but not of tropospheric ducts or ionospheric reflection. *Subject Headings:* **1. Sferics origin 2. Sferics variations 3. Tropospheric ducts 4. Ionospheric reflection 5. Mediterranean area.**—*M.R.*

## 1905

**4K–6** 551.508.94:551.515.4

Turpain, A., **Appareil pour l'observation et l'enregistrement automatique des orages.** [Instrument for observation and automatic recording of thunderstorms.] *Journal de Physique Théorique et Appliquée*, Paris, 4th Ser., 4:512–513, July **1905.** fig. **DLC**—An apparatus was devised by the author and installed at Puy de-Dôme meteorological observatory for recording the intensity of a radio atmospheric from an approaching thunderstorm. The device consisted of 7 Branly coherers of increasing sensitivity connected with a sensitive galvanometer. The intensity could be determined from the number and length of the marks produced on the photographic record by the galvanometer needle. *Subject Headings:* **1. Thunderstorm recorders 2. Sferics recorders 3. Branly coherer 4. Puy-de-Dôme Observatory, France.**—*M.R.*

## 1911

**4K–7** 551.501.83:551.515.4 551.594.22

Erskine-Murray, J., **The origin of "atmospherics" in wireless telegraphy.** *The Electrician*, N. Y., 67(6):219–220, May 19, **1911. DLC**—Evidence for lightning as a source of sferics was established when an approaching storm was heard on a radio; observed and followed by eye and by ear (radio) until beyond (40–50 mi) vision. "At every flash and absolutely simultaneously with it an ordinary X was audible." Thunderstorms within a thousand miles will produce X's (sferics). It is suggested that thunderstorms in Western "tropical Africa are observable within limitation of variation of transmissibility of electrical waves known to wireless operators." The long duration (hissing) sferics may be ascribed to brush discharges from the aerial. *Subject Heading:* **1. Sferics from lightning.**—*W.N.*

**4K–8** 551.508.94 551.509.5:551.515.4:551.501.83

Turpain, A., **Étude et enregistrement des orages. Leur prévision.** [Study and recording of thunderstorms. Their forecasting.] *Le Radium*, Paris, 8(11):419–423, Nov. **1911.** 7 figs. **DLC**—Several types of coherer sferics recorders devised by the author to predict or to warn of approaching thunderstorms are described and illustrated. The first—a simple Popov type device—was installed in 1902 in the Gironde District and gave 5 hours warning of an approaching storm (June 19, 1902); a combined sferics and pressure recording device was the next improvement. The equipment

mounted on the Puy-de-Dôme Observatory is illustrated. Two other modifications include the use of a milliammeter to show relative intensity of discharges and thus the approach of a storm. A balanced balometer or hot wire circuit to record accurately the amount of heat produced in platinum wires of 60$\mu$, 40$\mu$ and 30$\mu$ diameter, respectively, and photographic recorders were also devised. *Subject Headings:* **1. Sferics recorders 2. Thunderstorm forecasting from sferics 3. Photographic sferics recorders 4. Puy-de-Dôme Observatory, France.**—*M.R.*

## 1912

**4K–9** 551.501.83

Eccles, W. H. and Airey, H. Morris, **Note on the electrical waves occurring in nature.** *Royal Society of London, Proceedings, Ser. A*, 85(576):145–150, April 11, **1911.** 2 figs., 2 tables, 5 refs. Also: Eccles, W. H., **On the diurnal variations of the electric waves occurring in nature and on the propagation of electric waves round the bend of the earth.** *Ibid.*, 87(593):79–99, Aug. 13, **1912.** 9 figs., refs. **DLC**—In the first article the authors, by making carefully synchronized observations at London and Newcastle on a score of days in July–Sept. 1910, showed that between 60 and 80% of the sferics recorded at these 2 stations 270 mi apart were from the same source, as each sferic coincided to the second in time and in intensity. This led to the conclusion that the origin was at a place whose distance was great compared with the distance between the stations. The diurnal curves, especially in winter when the local effects are not pronounced, show anomalous changes during the twilight periods. At about 10 min before sunrise or after sunset an almost complete absence of noise was noted, the twilight effect is more noticeable at sunset than sunrise and with 6000 m than with 1000 m waves. After considering several explanations for such anomalous long distance propagation the author concluded that Heaviside's (1900) theory of an ionized ring in the middle atmosphere, caused by solar radiation, reflecting the waves was the most plausible, and explained sources which he located in N. Africa and America. *Subject Headings:* **1. Sferics theory 2. Sferics location 3. Twilight effects on sferics 4. Sferics reflections from ionosphere 5. Diurnal sferics variations.**—*M.R.*

**4K–10** 551.501.83:551.515.4 551.508.94

Flajolet, —, **Contribution à l'application de la télégraphie sans fil à l'étude et à l'annonce des orages.** [Contribution to the application of radio to the study and forecasting of thunderstorms.] *Académie des Sciences, Paris, Comptes Rendus*, 154(11):729–731, March 11, **1912.** **DLC**—Photographic records of intensity and deviation of sferics from thunderstorms of Oct. 18, 1911, Feb. 8 and March 4–5, 1912 made at Lyons are discussed and the crystal detector and galvanometer used described. Storms up to 500 km distant can thus be detected, giving the forecaster 24 hours notice of their arrival. The last named storm gave sferics that lasted 10 hours (1750h to 0550h). *Subject Headings:* **1. Photographic sferics recorders 2. Thunderstorm forecasting from sferics 3. Sferics recorders 4. Lyons, France.**—*M.R.*

## 1913

**4K–11** 551.501.83:551.515.4 551.594.11

Lutze, G., **Zusammenhang der Störungen des atmosphärischen Potentialgefälles mit der luftelektrischen Empfangstörungen der drahtlosen Telegraphie nach Untersuchungen am Boden und im Freiballon.** [Correlation between disturbances of the atmospheric potential gradient and the air-electric disturbances of wireless telegraphic reception as investigated at the ground and in free balloons.] *Physikalische Zeitschrift*, Leipzig, 14(21):1148–1151, Nov. 1, **1913.** 3 figs. **DLC**—The correlation was particularly good during formation of cumulus clouds and during an approaching thunderstorm. Balloon experiments showed that the disturbances increased in clouds, but with intensity decreasing with altitude. The phenomenon is due to local disturbances of the atmospheric electric equilibrium. *Subject Headings:* **1. Sferics from thunderstorms 2. Sferics from clouds 3. Balloon investigation of sferics 4. Atmospheric potential gradient.**—*W.N.*

## 1914

**4K–12** 551.501.83:551.58 551.515.4

Marriott, Robert H., **Radio range variation.** *Institute of Radio Engineers, N. Y., Proceedings* 2(1):37–58, March **1914.** 4 charts. Discussion p. 53–58. ref. **DLC**—Discussion of statistical results (shown on very detailed charts) of experiments with distance of radio reception between ships at sea off Coney Island, in the Great Lakes, etc. and in the Denver, Colorado, area as related to "atmospherics," temperature, humidity, vapor pressure, dew point, moonlight, daylight, etc. Atmospherics were related to temperature, being stronger in afternoon and in summer. The seasonal vapor pressure curve proved to be the inverse curve of distance of reception (vapor pressure in inches$\times$10) to the 5th power gave an index of strength of atmospherics above audibility. The question of whether the action of v.p. was in refracting, reflecting or absorbing power of the atmosphere *at* the station or *between* stations was not resolved. In the discussion AUSTIN CURTIS remark

on effect of local charges in thunder- or snowstorms on "noise" and on the "distant" effect of numerous lightning storms in the equatorial belt of calms which moves N. and S. with the sun. Thus in the northern summer sferics are almost constant in the North Atlantic, whereas in winter, when the belt is south of the equator, the radio reception is vastly improved. JULIUS WEINBERGER remarks on KIEBITZ's paper discussing calculations of refractive index for moist air and the consequent bending of emission waves toward the earth. JOHN STONE remarks on the ionizing effect of sunlight in upper atmosphere and consequences for radio propagation. DR. DE FOREST remarks on reflecting layers of heated air reported by TYNDALL and on similar reflecting of em. waves. GEORGE H. CLARK remarks on effect of a thunderstorm area between stations in cutting down signals until after it had passed the second station, when signals improved markedly. *Subject Headings:* **1. Sferics variations 2. Tropospheric propagation 3. Ionospheric radio wave reflection 4. Refractive index.**—*M.R.*

## 1916

**4K–13** 551.501.83:551.594.22 551.508.94

*Wilson, C. T. R., **On some determinations of the sign and magnitude of electric discharges in lightning flashes.** *Royal Society of London, Proceedings. Ser. A*, 92(644):555–574, Sept. 1, **1916.** 5 figs., tables, 5 refs. **DLC**—Records of field change due to lightning discharges were obtained by observing the time-interval between each sudden change of field and the succeeding thunder. The observers employed a specially developed apparatus whereby automatic records at a distance of 20 to 30 km were obtained. The details of its construction and application are outlined. The results presented in tables and curves include observations of storms during Aug. 12–15, most of which showed that the direction of current was upward, indicating that the falling raindrops were positively charged—the cloud negative. The lightning flash was estimated as about 33 coulombs. *Subject Headings:* **1. Sferic recorders 2. Sferics data 3. Sferics from lightning.**—*W.N.*

## 1917

**4K–14** 551.594.7:551.501.83

De Groot, Cornelis J., **On the nature and elimination of strays.** *Institute of Radio Engineers, N. Y., Proceedings*, 5(2):75–132, April **1917.** 17 figs., 4 refs. Discussion p. 121–132. 5 figs. **DLC**—In a long technical article on the comparative efficiency and cost of radio over cable communication in the East Indies the author shows the network, distances, stations, etc. involved in this elaborate program of study. Sferics are of 3 types: 1) clicks from distant lightning, 2) constant hissing when rain clouds pass over station and 3) rattles which are continuous but weak in a.m., strongest at night and often accompanying thunderstorms but not necessarily caused by them. In fact the author goes to great lengths to prove that noise of type 3) comes from solar particles bombarding the ionosphere (Heaviside layer), and not from thunderstorms. Sferics occur most often in tropics during west monsoon. A great deal of data was accumulated on intensity and type of sferics and accompanying weather conditions at all stations. *Subject Headings:* **1. Sferics types 2. Sferics in tropics 3. Netherlands Indies.**—*M.R.*

## 1920

**4K–15** 551.594.7:551.501.83

Keyser, C. N., **Detection of storms and their travel by radio equipment.** *Monthly Weather Review*, 48(5):263–264, May **1920. DLC, DWB**—Radio engineers at first attempted to find areas of sferics activity and to avoid them if possible in sending messages. Later it was found more effective to eliminate static by improving the receivers themselves. The meteorologist wants to forecast movements of fronts, storms and as in the case of the work of Naval Lt. W. F. REED at Pensacola, to forecast movements of hurricanes for aeronautics by sferics observations. *Subject Headings:* **1. Sferics from hurricanes 2. Hurricane forecasting from sferics 3. Pensacola, Fla. 4. Reed, W. F.**—*M.R.*

## 1921

**4K–16** 551.501.83:551.508.94

*Austin, L. W., **Determination of the direction of atmospheric disturbances or static in radio telegraphy.** *Franklin Institute, Journal*, 191(5):619–629, May **1921.** 3 figs., 8 tables. **DLC**—The author states that the accidental discovery that static may be directional was made independently by several observers in America during the summer of 1918. Studies were made with swinging loop antennas in Puerto Rico in Feb. 1920 and in Astoria, Ore., Bremerton, Wash., San Francisco, San Diego and Washington, D. C. by the U. S. Navy to determine the frequency of static from various directions. Definite centers were established and distant sources differentiated from nearby sources by the character of the wave spectrum. Those on the Pacific Coast were assumed to come from nearby sources (such as Mt. Rainier) though the author attributes the source of all sferics to electric discharges in the high atmosphere, not to thunderstorm or precipitation discharges.

*Subject Headings:* **1. Sferics direction finders 2. Sferics sources 3. Radiogoniometers 4. Puerto Rico 5. United States.**—*M.R.*

**4K–17** 551.594.7:629.12

Marchand, Henri, **Les applications de la radiotélégraphie dans la navigation aux États-Unis d'Amérique.** [Application of radiotelecommunication to navigation in the U. S.] *Revue Générale des Sciences Pures et Appliquées*, Paris, 32(21):594–596, Nov. 15, **1921. DLC**—Contains brief paragraph (6, "Prévision des orages") on locating thunderstorms by observing frequency and intensity variations of sferics. Winter storms over the North Atlantic, it is declared, are usually of cyclonic origin and do not produce noticeable changes in the distribution of sferics. *Subject Headings:* **1. Sferics thunderstorm detection 2. Sferics distribution 3. Marine navigation.**—*G.T.*

**4K–18** 551.509:551.515.4:551.501.8

Reichelderfer, F. W., **Forecasting thunderstorms by means of static electricity.** *Monthly Weather Review*, 49:152–153, March **1921. DWB**—A wireless set with a six step amplifier operating at a wavelength of 600–2500 m gave better results of directional observation of "strays" in the 900 m range. The NW–SE direction of strays was most frequent and the intensity was 1.9 and 1.4, respectively, on days with and without thunderstorms. Observations of this kind in connection with the weather map are expected to become valuable in thunderstorm forecasting. *Subject Headings:* **1. Thunderstorm forecastings from sferics 2. Sferics direction finders.**—*M.R.*

## 1922

**4K–19** 551.508.83

Khäler, K., **Über die Ursachen einiger einfachen luftelektrischen Störungen.** [Causes of a few simple atmospheric electrical disturbances.] *Meteorologische Zeitschrift*, 3910:293–298, Oct. **1922. DLC**—This investigation of disturbances of the atmospheric electric field results in the conclusion that: the negative electrification concept of dust clouds does not hold, the negative field in rain is not explained by upward rebound, and the influence of clouds is overestimated. Storms are accompanied by charged air masses. *Subject Heading:* **1. Sferics theory.**—*W.N.*

**4K–20** 551.501.83:551.501.81

Lacoste, J., **Nouvelles observations radiogoniométriques des parasites atmosphériques.** [New radiogoniometric observations of atmospherics.] *Académie des Sciences, Paris, Comptes Rendus*, 175:707–708, **1922. DLC**—The author reports measurements of atmospherics made in Strasburg in 1922. The use of a frame antenna made it possible to determine the direction of the source of disturbance. Several examples of successful observation and coordination with weather phenomena are offered. The author finds evidence confirming earlier views on the correlation of sferics with depressions or thunderstorms. *Subject Headings:* **1. Radiogoniometers 2. Strasburg, France.**—*G.T.*

**4K–21** 551.594.7:551.515.4

Paoloni, Bernardo M., **Lo studio dell'elettricita e dei temporali mediante la radiotelegrafia.** [Study on electricity and thunderstorms by means of radiocommunication.] *Meteorologia Pratica*, Turin, 3:22–26, 152–170, **1922.** fig., table, 12 refs. **DWB**—The history of attempts at locating or forecasting storms, especially thunderstorms, by recording effects on galvanometers (1869 by RAGONA in Modena, Italy) or currents induced in antennas (POPOV in Russia in 1895) and later work in England, U. S., France and Italy by systematic study of sferics in relation to lightning or cyclonic storms is reviewed thoroughly. The particular work done at Montecassino Observatory, Italy, beginning in 1914 and the scale of sferics adopted by the author are presented in detail. Studies aimed at the discovery of conditions in the stratosphere are enumerated. *Subject Headings:* **1. Sferics research 2. Sferics scales 3. Structure of the stratosphere 4. Montecassino Observatory, Italy.**—*M.R.*

**4K–22** 551.501.83:551.515.4

Staye, Karl, **Luftelektrische Empfangstörungen.** [Radio disturbances due to atmospheric electricity. *Jahrbuch der Drahtlosen Telegraphie und Telephonie*, 20(2):303–305, Aug. **1922.** 4 refs. **DLC**—Sferics observations on 600–2000 m wavelength were conducted in the upper Rhine region during 1915–1917. Each stage of formation of a thunderstorm can be identified by the distinct but different sound type of sferics. The 10 listed types identify themselves with front, cloud-types, fog, lightning. The minima observed during sunrise and sunset were markedly sharp. *Subject Headings:* **1. Sferics wave forms 2. Sferics from thunderstorms 3. Upper Rhine, Germany.**—*W.N.*

**4K–23** 551.501.83

*Watson-Watt, R. A., **The origin of atmospherics.** *Nature*, London, 110(2768):680–681, Nov. 18, **1922.** tables. **DLC**—Analysis of directional arrival of sferics as observed at 12 stations

ndicated that sferics were more related to rainfall than to thunderstorms. This was concluded rom comparisons of geographic locations with meteorological data. *Subject Headings:* **1. Sferics rigin 2. Sferics direction data.**—*W.N.*

1923

**4K–24** 551.594.7 551.501.83:551.515

Cave, C. J. P. and Watson-Watt, R. A., **The study of radiotelegraphic atmospherics in relation o meteorology.** *Royal Meterological Society, Quarterly Journal*, 49:35–39, Jan. **1923. DLC**—Boggio ERA (*see* 4K–3 above) showed that sferics indicated the approach of thunderstorms. It was later stablished that sferics are stronger in lows, high winds, rapid temperature changes and in heavy rain. Direction finding between the years 1916–1920 followed storms 5–1000 miles from the observational ites and subsequent weather reports confirmed these observations. *Subject Headings:* **1. Sferics esearch 2. Sferics thunderstorm detection.**—*W.N.*

**4K–25** 551.501.83:551.576.1:551.515.4

Pick, William H. and Watson-Watt, R. A., **Observations on "atmospherics" at Cranwell.** *Meteorological Magazine*, London, 58:85–87, **1923. DWB**—W. H. Pick mentions observations made by Flight-Lieut. D. Rodney at Cranwell, wherein a sizzle or roar was heard on the radio-receiver during passage of CuNb clouds with or without rain or thunder over the receiving station. R. Watson-Watt explains this phenomenon as arising from the discharge of charges induced on the antenna by the intense electric field of the thunderclouds. This phenomenon should be distinguished from "clicks" due to lightning. *Subject Headings:* **1. Sferics from thunderclouds 2. Induced charges.**—*M.R.*

**4K–26** 551.501.81:551.501.83 551.509:551.501.83

Rothé, E., **Sur la radiogoniométrie des parasites atmosphériques et la prévision du temps.** [On he radiogoniometry of atmospherics and weather forecasting.] *Onde Électrique*, Paris, 2:7–18, an. **1923. DLC**—Propagation experiments from the Eiffel Tower established that sferics came from ocal and distant storms. Later work established sferics as subject to diurnal variations and their requencies correlated with frequency of lows. *Subject Headings:* **1. Radiogoniometry 2. Weather orecasting from sferics.**—*W.N.*

**4K–27** 551.501.83:621.317.35

Schindelhauer, F., **Über die Richtung atmosphärischer Störungen.** [Direction of sferics.] *Jahrbuch der Drahtlosen Telegraphie und Telephonie*, 22(4):163–167, Oct. **1923.** figs., ref., eqs. **DLC**—Observations conducted at the Potsdam Observatory in March 1922 by means of a rotary rame operating within 21,000 m wavelength, showed that the NS direction of sferics was remarkably onstant and independent of the weather conditions. The diurnal variation observed indicated olar relation. Direction during night hours showed no distinct trend. The maximum intensity vas at 18 h with minimum at 8 h. *Subject Headings:* **1. Sferics intensities 2. Solar influences 3. Sferics direction recorders 4. Potsdam, Germany.**—*W.N.*

**4K–28** 551.501.83:621.317.35

*Watson-Watt, R. A., **Directional observations of atmospherics 1916–1920.** *Philosophical Magazine*, London, 45(269):1010–1026, May **1923.** 4 figs., 2 tables. Also: **Directional observations of atmospheric disturbances 1920–21.** *Royal Society of London, Proceedings, Ser. A*, 102(717):460–478, Jan. 1, **1923.** 9 figs., 4 tables. **DLC**—1) A statistical analysis of the 1300 bearings of atmospherics taken between 1916–1920 by six British coastal direction finding stations. (*Same item as* 2H–1, Aug. 1951, *MAB.*) 2) Condensed and analyzed data of observations at Aldershot covering a whole year are presented in tables and curves. *Subject Heading:* **1. Sferics direction data.**—*W.N.*

**4K–29** 551.501.83

*Watson Watt, R. A. and Appleton, E. V., **On the nature of atmospherics. Pt. 1.** *Royal Society of London, Proceedings, Ser. A.*, 103(720):84–102, April 3, **1923.** 4 figs., tables, 9 refs., 9 eqs. **DLC**—The theoretical basis for the use of cathode-ray oscillographs in sferics observations is given along with classification of aperiodic and quasi-periodic sferics. Observational results of the initial experiments, covering a 10-day period, are given. Five hundred and ninety sferics were observed of which 516 were of sufficient accuracy to be reduced into frequency curves relating to each type and their interrelation. Data in tables. *Subject Headings:* **1. Sferics data 2. Cathode-ray oscillographs 3. Sferics classification.**—*W.N.*

1924

**4K–30** 551.501.83:551.594.6

Austin, Louis W., **Our present knowledge concerning the atmospheric disturbances of radio elegraphy.** *National Research Council, Washington, D. C., Bulletin*, 41:127–130, Jan. **1924. DLC**—

This summary classifies sferics according to the characteristics of noises heard on telephones and radios. It is known that this form of disturbance is more severe in warm months, particularly in the tropics, varies from year to year and increases with the wave length tuned to. The "clicks" are ascribed to flashes from distant thunderstorms, whereas the "hisses" are due to the discharge of dust, snow or rain striking the antenna. The "rumblers" (grinders) seem to exist on all presently used wave lengths and frequencies and may be ascribed to some kind of electrical readjustments in the upper atmosphere. Their centers seem to have more or less constant direction, and originate over land rather than sea. Secondary centers may well be mountains or nearby clouds. Suggestions for a research program are given along with reference to a developed direction recorder in use in England. *Subject Headings:* **1. Sferics research 2. Sferics classification 3. Sferics recorders.** —*W.N.*

**4K–31** 551.594.7 551.5:551.501.83

Bureau, Robert, **Origine météorologique de certaines perturbations des recepteurs de télégraphie sans fil.** [Meteorology and atmospherics.] *Académie des Sciences, Paris, Comptes Rendus*, 178:556–558, Feb. 4, 1924. **DLC**—Comparison between radiogoniometric measurements and meteorological observational data indicated that sferics came from regions with polar air masses. The distinctly increased sferics resulting from the effect of alpine ranges on such air masses is exemplified. The peculiar influence of evaporating alpine snow fields on sferics is discussed, considering influence of air temperature and the influence of solar radiation on snow fields. *Subject Headings:* **1. Sferics from polar air masses 2. Mountain effects 3. Snow effects.**—*W.N.*

**4K–32** 551.501.83:551.515.8

Bureau, Robert, **Influences des discontinuités météorologiques sur certaines perturbations atmosphériques en telégraphie sans fil.** [Effect of meteorological discontinuities on certain atmospheric perturbations in wireless telegraphy.] *Académie des Sciences, Paris, Comptes Rendus*, 178(20):1623–1625, May 12, 1924. **DLC**—The author further develops the idea that atmospherics are due to polar air. It is shown that polar air is the seat of both meteorological and electromagnetic disturbances. Polar air is also the seat of a very considerable potential energy which is expanded in various possible ways, and appears in the form of kinetic energy and electromagnetic energy among others. In contrast, equatorial air is said to be characterized by a meteorological stability and an electromagnetic calm. *Subject Headings:* **1. Sferics theory 2. Sferics from polar air masses** —*Physics Abstracts.*

**4K–33** 551.501.83:551.515.8

Bureau, Robert, **Relations entre certains atmosphériques et les phenomènes météorologiques.** [Relations between atmospherics and meteorological phenomena.] *Onde Électrique*, Paris, 3:385–401, Aug. 1924. figs., diagrs., charts. **DBS, DLC**—The relationship between cold (polar) and warm (equatorial) air masses and sferics is treated. Reference is made to work by Popov and others as well as to Norwegian work on discontinuities. Sferics in temperate zones are verified by simultaneous meteorological observation. Air mass movement is slow in winter, hence little sferics. Sferics, however, are increased markedly by the influence of mountains on the movement of air masses. *Subject Headings:* **1. Sferics from air masses 2. Mountain effects.**—*W.N.*

**4K–34** 551.501.83:551.515.8

Bureau, Robert and Viaut, A., **Conditions météorologiques de l'apparition de certaines perturbations atmosphériques dans les appareils récepteurs de T.S.F.** [Meteorological conditions associated with the appearance of certain atmospheric disturbances in radio reception.] *Académie des Sciences, Paris, Comptes Rendus*, 179(7):394–397, Aug. 18, 1924. 4 refs. **DLC**—Sferics observations in France and the Pyrenees are correlated with "Bjerknes" air masses and fronts, and from examples in May 1924 it is shown that sferics are invariably associated at all seasons with cold fronts (invasions of polar air masses) even when no thunderstorms occur, and that sferics are surpressed when a warm front arrives, when cold fronts cross mountainous regions or heated surfaces, the sferics are reinforced or increased. *Subject Headings:* **1. Sferics from cold fronts 2. Mountain effects.**—*M.R.*

**4K–35** 551.501.83:551.43

Marriott, R. H., **Atmospherics.** *Institute of Radio Engineers, N. Y., Proceedings*, 12:533–537, 1924. **DLC**—Tests conducted in the summer of 1920 and 1921 showed that static sources were usually located on or near the high glaciated volcanic peaks which rim the Pacific Coast from Alaska to California (Mts. Rainier, Adams, St. Helen's, Hood, Wilson, etc.). A point (Pop Point on Thorne Arm) was found 26 km east northeast of Ketchikan, Alaska, where no static could be obtained for six entire days though radio stations in all directions except east and southeast could be heard. Vague statements as to the cause of the static associated with the high mountains in the

ath of heated air from the Pacific give no clue as to whether the sources are thunderstorms or snow tatic. [At that season (July–Aug.) thunderstorms are not uncommon over the higher peaks of he Cascade Range.] *Subject Headings:* **1. Sferics from mountains 2. Pacific Northwest 3. Alaska.** —*M.R.*

**4K–36** 551.501.83

Moullin, E. B., **Atmospherics and their effect on wireless receivers.** *Institution of Electrical Engineers, London, Journal,* 62(328):353–372, April **1924.** 10 figs., 5 tables, refs., 18 eqs. Discussion p. 366–372. **DLC**—This mathematical analysis involves formulas that give the ratio of ignal strength to sferics and shows that these formulas are identical for a given wave length. The ffect of sferics on tuned looped antennas is calculated. Comparison indicated that sferics depend n the decrement of the first oscillatory circuit and that current limiters or directional devices will educe the disturbances. *Subject Headings:* **1. Sferics wave forms 2. Sferics theory 3. Radio nstruments.**—*W.N.*

## 1925

**4K–37** 551.515.4

Brooks, Charles E. P., **The distribution of thunderstorms over the globe.** *Great Britain. Meteorological Office, Geophysical Memoirs,* No. 24:147–164, **1925.** 7 figs., 8 tables, 13 refs. **DLC**—This monograph has been quoted in nearly every work on sferics or thunderstorm electricity since t appeared. An estimate was made of the number of thunderstorms occurring each day, month nd year over the entire globe and from those data the number of lightning strokes per second 100) or per hour (360,000) or that 1800 thunderstorms were going on at any moment. The areas f maximum frequency at any given season coincide very closely with the sferics source or direcional frequency data obtained by other methods since 1925. *Subject Headings:* **1. Global thunderstorm distribution 2. Lightning frequencies 3. Sferics from thunderstorms.**—*M.R.*

**4K–38** 551.594.221:551.594.11

Dwight, C. H., **Effects of atmospheric electric discharges upon the potential gradient.** *Terestrial Magnetism and Atmospheric Electricity,* 30(3):101–110, Sept. **1925.** fig. **DLC**—An apparatus responding to rapid fluctuations in the potential gradient and photographic recording nethods were used in this investigation on the possible presence of several forms of electrical disharges in the atmosphere. No variations not attributable to lightning or other known sources were ound. *Subject Headings:* **1. Atmospheric potential gradient 2. Photographic recording of electrical lischarges.**—*W.N.*

**4K–39** 551.515.4

§Gockel, Albert, **Das Gewitter.** [The thunderstorm.] Berlin, Ferd. Dümmlers, **1925.** 3rd ed. rev. 316 p. 36 figs., 3 plates, tables, refs. **DWB**—This text intensively and systemtically covers every aspect of thunderstorm electricity and other phenomena related to thunderstorms (thunderclouds, lightning, ball lightning, St. Elmo's fire, thunder, lightning danger, lightning ods, hail, solar relations, thunderstorm rain, forecasts and lightning photography). Chap. 16 deals vith the geographical distribution of thunderstorms and Chap. 19 (p. 309–311) with the history of utomatic thunderstorm recorders (Popov, 1896, Ducretet, Fenyi, 1902) and later research on tmospherics. Because of the numerous types of radio noise not originating in thunderstorms, the uthor does not have much faith in this method of thunderstorm location or prediction. *Subject Headings:* **1. Thunderstorms 2. Thunderstorm electricity 3. Sferics research 4. Textbooks.**—*M.R.*

**4K–40** 551.501.83:551.43

Lugeon, Jean, **Relations entre diverses discontinuités météorologiques et les oscillations hertziennes parasites au voisinage des chaînes de montagnes.** [Relation between different meteorological discontinuities and Herzien parasite oscillations in the vicinity of mountain ranges.] *Académie des Sciences, Paris, Comptes Rendus,* 180(7):594–597, Feb. 23, **1925. DLC**—Systematic observations made at Lausanne (1919–1922) and at Zurich during 1924 by the author and collaborators lead to the following conclusions: sferics differ greatly between plains, valleys and mountains, but not with meteorological situation on the continent. However, the lapse rates and the electrical or weather conditions in the immediate Alps have a direct relation to intensity and number of sferics. Directional (goniometric) measurements gave a great deal of information about peculiar topographic effects with changing air mass or weather conditions. In general, sferics decrease with elevation and are closely related to lapse rate (more with steeper lapse rate). Range of disturbances n the lower levels seldom exceeds 250 km and is usually less than 150 km in the mountains. Tropical air from the west hitting peaks at 3–4 km altitude carried with it a zone of strongly *increased* sferics, though the *high* mountain stations show a corresponding *decrease.* The squall line 100–150 km

ahead of the cold front (zone of increased lapse rate) comprises an area of increased sferics activity in the Jura. *Subject Headings:* **1. Sferics from mountains 2. Lapse rate effects on sferics 3. Orographic effects 4. Switzerland.**—*M.R.*

**4K–41** 551.501.83 551.509.1

Lugeon, Jean, **Sur un procédé nouveau expérimental pour l'exploration des parasites atmosphériques.** [A new experimental procedure to detect atmospheric parasites.] *Archives des Sciences Physiques et Naturelles*, 7:408-409, Nov./Dec. **1925. DLC**—The author established a network of sferics stations with one central receiving station at Zurich composed of 3 receivers tuned on relay stations at Paris, Chelmsford and Höngg. By recording the reception from two or more stations simultaneously on the same tape it is not necessary to have absolute synchronization of time as it is when the recording is made at distant stations. *Subject Headings:* **1. Sferics networks 2. Sferics recording methods 3. Zurich, Switzerland.**—*M.R.*

**4K–42** 551.501.83

*Watson-Watt, R. A., **Atmospherics.** *Physical Society of London, Proceedings*, 37:23D–31D. **1925.** 5 figs., table, 4 refs. **DLC**—Nature and origin of sferics are discussed. Relation between sferics and meteorological conditions, such as thunderstorms, precipitation, barometric pressure and fronts was established in 87% of 490 cases. Wave forms as obtained by cathode ray oscillographs are discussed and the status of current investigations is summarized. *Subject Headings:* **1. Sferics wave forms 2. Sferics origin 3. Sferics research.**—*W.N.*

**4K–43** 551.501.83:551.509:551.515.4

Watson-Watt, R. A., **The beneficence of atmospherics.** *Royal Aeronautical Society, London Journal*, 29(170):62–75, Feb. **1925.** 2 maps, table. **DLC**—Lecture presented at a meeting of the Society on Dec. 18, 1924. Sferics (long distance instantaneous and automatic signals of thunderstorm conditions) were discussed as they relate to a contemplated thunderstorm warning service. The postulates were: 1) most recognizable types of sferics, if not all, come from discharges of lightning character, 2) accurate determination of source locality is possible, 3) forecasts and movements of centers of storms to avoid transport risks, 4) method of avoiding any storm involving such risks and 5) most reliable system with least possible percentage of errors. *Subject Headings:* **1. Sferics research 2. Thunderstorm forecasting from sferics.**—*W.N.* & *M.R.*

## 1926

**4K–44** 551.501.83

*Appleton, E. V.; Watson-Watt, R. A. and Herd, J. F., **On the nature of atmospherics. Pts. II and III.** *Royal Society of London, Proceedings, Ser. A.*, 111(759):615–677, July 2, **1926.** figs., tables, eqs. **DLC**—II. A developed cathode ray oscillograph and improved method necessitate a rediscussion of the first paper (*see* 4K–42 above). Results of statistical analysis of about 8000 drawings of sferics wave forms are tabulated and a more detailed sub-classification is included. Fine structure sferics as observed in non daylight hours in the tropics are presented in oscillograms. III. Sferics from thunderstorms are treated. The magnitude of electric field changes due to lightning is formulated in an equation. Observations conducted at 4 different stations show that the negative field changes (at distances beyond 50 km) are about 1.7 times as frequent as the positive changes. Bi-polarity is evident. Support is given to WILSON's theory on thunderstorms. The data presented in tables and graphs are discussed along with improved apparatus and methods of use. *Subject Headings:* **1. Sferics classification 2. Sferics wave forms 3. Sferics from lightning 4. Sferics data.**—*W.N.*

**4K–45** 551.501.83

Ashwin, Cecil, **Atmospherics: origin, range and directional properties.** *Marine Observer* London, 3:134–137, **1926. DWB**—Atmospherics are classified as clicks, hisses, grinders and freaks. Clicks are attributed to lightning or meteors; hisses to electrically charged rain, hail or snow striking the aerial. Most atmospherics, however, are said to be due to wind shear, or the friction of air on air wherever the wind changes direction or speed. Elaborate "proof" in text and diagram is presented to support this theory especially as applied to hurricane areas. *Subject Headings:* **1. Sferics theory 2. Sferics classification 3. Wind shear theory of sferics.**—*M.R.*

**4K–46** 551.501.83

*Austin, L. W., **Direction determinations of atmospheric disturbances on the Isthmus of Panama.** *Institute of Radio Engineers, Proceedings*, 14(3):373–376, June **1926.** fig., table. **DLC**—Directional measurements made from Feb. to Nov. 1925 at Balboa and Colon show that sferics generally originate over land rather than over sea. The results of observations are tabulated. *Subject Headings:* **1. Sferics origin 2. Canal Zone.**—*W.N.*

**4K–47** 551.501.83

*Austin, L. W., **The present status of radio atmospheric disturbances.** *Institute of Radio ngineers, Proceedings*, 14(1):133–138, Feb. **1926.** 13 refs. **DLC**—Theories and contributions to ie knowledge of origin and nature of sferics by Eccles, De Groot, Weagant, Mosler, Brit. Met. ff., Appleton, Watson-Watt, Wilson, Bureau, Terry and Eckersley are reviewed. The eneral belief that thunderstorms are the main source gives no knowledge as to the connection etween lightning and sferics, nor the influence of solar activity, precipitation and clouds. The nown facts on sferics are summarized. *Subject Heading:* **1. Sferics theory.**—*W.N.*

**4K–48** 551.501.83

Baumler, M., **Simultaneous atmospheric disturbances in radio telegraphy.** *Institute of Radio ngineers, Proceedings*, 14(6):765–711, Dec. **1926.** 7 figs. **DLC**—Transmission and recorded ception tests made from Germany—U.S.A.—Hawaii and vice versa showed that sferics occurred the respective locations simultaneously. The effect of distant lightning was established. The fect of thunderstorms in Hawaii during the tests was at times so strong that observations were spended to prevent harm to observers and apparatus. *Subject Headings:* **1. Sferics from thunder- orms 2. Hawaii.**—*W.N.*

**4K–49** 551.501.83

*Duckert, Paul, **Einiges über atmosphärische Störungen der elektromagnetischen Energie- ertragung.** [Remarks on atmospheric disturbances in electromagnetic energy transmission.] *indenberg, Germany. Aeronautisches Observatorium, Arbeiten*, 15:297–305, **1926.** 3 tables, 33 eqs. **LC**—The theoretically minded reader will find in this paper a detailed analysis of the relation etween the transmitted electromagnetic oscillations and the disturbances in radio communication used by sferics. Since the characteristics of these disturbances are not known generally, a Fourier tegral was adopted. One of the results of the transmitted signal and of the disturbance is:

$$X \approx \frac{1}{\pi^2} \frac{E^2 \cdot T}{2\delta \cdot y(\omega)};$$

—duration of the disturbance, $E$—electromotoric force, $\delta$—damping constant of the receptor, $(\omega)$—intensity of the disturbance at the frequency of the receptor. The author's observations owed that the intensity of detected sferics increases with wave length (600–16,000 m) during the ay and during the night has a maximum at 2000 m. *Subject Headings:* **1. Sferics theory 2. Radio ception 3. Diurnal sferics variations 4. Lindenberg, Germany.**—*A.A.*

**4K–50** 551.501.83

Hubert, Henri, **Premières observations relatives aux parasites atmosphériques en Afrique ccidentale.** [First observations of atmospherics in W. Africa.] *Académie des Sciences, Paris, omptes Rendus*, 183:368–370, **1926. DLC**—In connection with observations of sferics at Darav 925–26) the author describes three different types of sferics (as defined by E. Rothé and J. La- oste) viz. "discharges," "cracklings" and "crackings" (the latter two, being hard to distinguish e treated as a single group), their directional and diurnal distribution and other properties. While discharges" are directly connected with lightning strokes, "cracklings" and "crackings" appear to e due to oscillatory, non luminous and inaudible discharges produced at frequent intervals between r masses with different potentials, at several thousand km altitude. *Subject Headings:* **1. Sferics pes 2. Darav, West Africa.**—*G.T.*

**4K–51** 551.501.83:551.509

§Jensen, J. C., **Can we forecast radio reception from weather?** *Tycos Rochester*, Rochester, . Y., 16(2):49–56, April **1926.** 8 figs. Reprint from: *Radio Broadcast*, N. Y., March **1926. LC**—Radio reception investigations made by various laboratories with the collaboration of radio nateurs gave valuable statistical data regarding relation of propagation conditions, static intensity, c. to synoptic and local weather conditions. Crashing, hissing, fading and unusually good recep- on may be used to roughly forecast weather patterns, and weather conditions can be used to recast reception, though other factors are sometimes involved. *Subject Headings:* **1. Radio wave opagation 2. Weather forecasting from sferics 3. Forecasting of atmospherics.**—*M.R.*

**4K–52** 551.594.7 551.501.83

*Paoloni, Bernardo M., **Metodo per osservare gli atmosferici della radiotelegrafia e primi risultati tenuti.** [Method of observing sferics in radiotelecommunication and first results obtained.] *leteorologia Pratica*, Turin, 7:20–43, **1926.** 4 tables, 3 refs. **DWB**—Measurements of sferics onducted since 1925 by the Comitato Italiano di Radiotelegrafia Scientifica are described (distribu- on of stations, time of measurement, instrumentation, etc.). Monthly activities of sferics (classified

into 14 types) observed at 14 stations throughout Italy are tabulated. The classification system adopted for listing sferics and accompanying weather phenomena is explained. *Subject Headings* **1. Sferics data 2. Sferics classification 3. Sferics measurement 4. Italy.**—*G.T.*

**4K–53** 551.501.83:551.5(016)

†Watson-Watt, R. A., **Abstract on papers on the meteorological relations of atmospherics.** *Royal Meteorological Society, Quarterly Journal,* 52(218):199–208, April **1926. DLC**—The bibliography includes 39 abstracted items covering the period 1902 to 1925 inclusive. "Summaries of the most recent work show that the location of 'cold fronts' by radiotelegraphic observation on atmospherics is an established possibility." *Subject Headings:* **1. Sferics bibliographies 2. Sferics from fronts.**—*G.T.*

**4K–54** 551.501.83:551.501.8

*Watson-Watt, Robert A., **The directional recording of atmospherics.** *Institution of Electrical Engineers, London, Journal,* 64(353):596–610, May **1926.** 13 figs., 2 tables. Also: Watson-Watt, R. A. and Herd, J. F., **An instantaneous direct-reading radiogoniometer.** *Ibid.,* p. 611–617, 5 figs. Discussion p. 6.7–622. **DLC**—The first paper constitutes a systematic summary of work to date in radiogoniometry of sferics, including detailed description and illustration of equipment used in England and Scotland. The Abraham-Bloch oscillograph, the recorder, sample traces and diurnal variations in intensity of sferics are shown graphically. Twilight effects and diurnal variations in direction of maximum sources associated with solar and synoptic conditions are discussed and supporting data presented. The second paper describes the improved cathode ray oscillograph direct reading radiogoniometer and the installation set up by the authors. *Subject Headings* **1. Radiogoniometry 2. Cathode-ray oscillographs 3. Sferics direction data 4. Great Britain. I. Herd, J. F.**—*M.R.*

## 1927

**4K–55** 551.501.83:551.590.2

*Austin, L. W., **Radio atmospheric disturbances and solar activity.** *Institute of Radio Engineers, Proceedings,* 15(10):837–842, Oct. **1927.** 7 figs., 3 refs. **DLC**—Data on daylight disturbances (1918–1927) obtained by the shunted telephone method on 9000–20,000 m wave lengths was experimentally "compared" with results obtained by measuring the signal strength. It was indicated that a negative correlation with sunspots exists. The influence of solar activity on weather may be the indirect cause. Thunderstorm (about 200 mi from Wash., D. C.) sferics showed close relationship with temperature. The results are presented graphically. *Subject Headings:* **1. Sferics 2. Solar influences 3. Sunspots 4. Sferics from thunderstorms 5. Temperature influences.**—*W.N.*

**4K–56** 551.501.8

*Cairns, J. E., **Atmospherics at Watheroo, Western Australia.** *Institute of Radio Engineers, Proceedings,* 15(12):985–997, Dec. **1927.** 5 figs., table, ref. **DLC**—Several thousands of sferics were examined before March 20, 1927, when night observations with a calibrating oscillator began. About 1000 of the obtained wave forms were statistically analyzed; most of them were negative peaked quasi-periodic. Positive sferics were invariably associated with lightning. Semi-permanent field changes—produced by 50 km distant thunderstorm—were most frequent; the negative occurred more often than the positive. *Subject Headings:* **1. Sferics wave forms 2. Sferics from lightning 3. Sferics from thunderstorms 4. Watheroo, Western Australia.**—*W.N.*

**4K–57** 551.594.7:551.501.8

*†Royal Meteorological Society. Committee on the Relation between Atmospherics and Weather. **The range of atmospherics.** *Royal Meteorological Society, Quarterly Journal,* 53(224):327–400, Oct. **1927.** figs., numerous tables, numerous refs. Discussion p. 389–400. **DLC**—The report begins with a historical summary dating back to 1910. The scheme of observations organized by the Committee (48 listeners recording individual atmospherics on typescript of broadcasts on 350–40 and 600 m) and reduction of data are described. The effective range of atmospherics is found to extend to at least 1850–4500 mi. Sources were compared statistically with working synoptic charts. Detailed records and located sources are listed and discussed. Discussion includes a contribution by R. BUREAU on atmospherics of local origin. *Subject Headings:* **1. Sferics research 2. Sferics range 3. Sferics data. I. Bureau, Robert.**—*W.N.*

**4K–58** 551.501.83:551.515.

Gherzi, Ernesto, **Atmospherics and typhoons at sea.** *Marine Observer,* 4(44):159–160, Aug. **1927.** figs. **DLC**—Brief article citing several interesting cases in which ships reported definite decreases in sferics with the approach of typhoons, indicating that typhoon centers do not cause radio disturbances. *Subject Heading:* **1. Sferics from typhoon centers.**—*M.P.K.*

4K–59 551.594.7:551.501.83

†§Kincaid, E. M., **Two contrasting examples wherein radio reception was affected by a meteorological condition.** *Institute of Radio Engineers, Proceedings*, 15(10):843–868, 1927. 15 figs., bibliog. **DLC**—A definite relationship between sferics and meteorological conditions was established and the e of this fact in forecasting weather and/or radio communication (sferics) is the purpose of this cellent study. Two synoptic examples indicate that "highs" are relatively free of static, "lows" mewhat proportional to intensity of the disturbance. An abstracted bibliography is included and e Kincaid sferics recorder is described. *Subject Headings:* **1. Forecasting of atmospherics 2. Sferics bliographies 3. Weather forecasting from sferics.**—*W.N.*

4K–60 551.501.83:551.515.8

Watson-Watt, R. A., **The weather and its ways. Broadcast talk No. 3.** *Royal Meteorological ociety, Quarterly Journal*, 53(222):169–172, April 1927. **DLC**—The subject of sferics and the mosphere is casually mentioned in the life story of a deep depression, showing atmospherics to be e sign of an approaching front. *Subject Heading:* **1. Sferics from fronts.**—*W.N.*

1928

4K–61 551.501.83:551.515:551.509

§Dean, S. W., **Correlation of directional observations of atmospherics with weather phenomena.** *nstitute of Radio Engineers, Proceedings*, 17(7):1185–1191, July 1928. 3 figs., 4 refs. **DLC**—Two orms (6–18 Sept. 1928) were followed on the cathode ray direction finder at Houlton, Maine, and owed close relation with the weather map data. Storms were detected up to 2000 mi from Houlton; so in areas beyond the weather map. Lightning is believed to be the cause of sferics. Storms n be identified from the associated advancing edges of lows, and there is reason to believe that e degree of sferics increases with speed of movement of low. Application of sferic direction finding weather forecasting is suggested. *Subject Headings:* **1. Sferics sources 2. Weather forecasting om sferics 3. Houlton, Maine.**—*W.N.*

4K–62 551.501.83

Ilardi, Piero, **Fenomeni radioatmosferici.** [Radioatmospheric phenomena.] *Meteorologia ratica*, Turin, 10(2):53–80, March/April 1928. 5 figs., refs. **DLC**—After giving a long historical ccount of Italian discoveries in the field of atmospheric electricity and radio propagation and the arious classification systems for sferics (including PAOLONI's system), the results of recent studies re summarized in regard to seasonal and diurnal variations, relation to insolation, pressure, cloudiess, storms, orography, air masses, rain and astrophysical phenomena. The experiments of the oyal Society and the Italian Radioatmospheric Service and studies at Montecassino are reviewed detail; aural and automatic recorders are also described. *Subject Headings:* **1. Sferics research Sferics classification 3. Sferics networks 4. Italy.**—*M.R.*

4K–63 551.508.94

Judson, E. B., **An automatic recorder for measuring the strength of radio signals and atmospheric disturbances.** *Institute of Radio Engineers, Proceedings*, 16(5):666–670, May 1928. 4 figs. **DLC**—The instrument is presented in diagrams; its performance and some typical curves of sferics re presented and discussed. *Subject Heading:* **1. Sferics recorders.**—*W.N.*

4K–64 551.508.94:551.515.8

Lugeon, Jean, **Un appareil radioélectrique pour déceler l'origine géographique de l'air.** [Radioelectric apparatus for detection of the geographical origin of air.] *Archives des Sciences Physiques Naturelles*, Geneva, 10:311–312, Sept./Oct. 1928. **DLC**—A note telling of the atmoradiograph onstructed by the author in 1927 along the lines of the Popov receiver, and used for over a year to ecord sferics at Zurich. Concludes that a strong correlation exists between character of sferics ecords and nature of air mass above the region; tropical, maritime, polar and continental air can nus be differentiated. *Subject Headings:* **1. Sferics recorders 2. Sferics from air masses 3. Zurich, witzerland.**—*M.R.*

4K–65 551.501.83:551.515.8

Lugeon, Jean, **Les atmosphériques des fronts quasi-stationnaires sur le versant nord des Alpes.** Sferics from quasi-stationary fronts on the northern slope of the Alps.] *Archives des Sciences Physiques et Naturelles*, Geneva, 10:68–76, Jan./Feb. 1928. 3 tables, refs. **DLC**—Considering the ntensity and number of sferics as an indication of the total amount of energy in the atmosphere of a ertain area, the author has attempted to correlate the sferics data with frontal or synoptic data rom various sectors of the region of the Alps in Europe. Several synoptic cases (Sept.–Oct. 1926 nd April 1927) are analyzed in detail in text and tables together with intensity (hourly and daily

means) of sferics. A good agreement is found between dynamic conditions and sferics intensity. *Subject Headings:* **1. Sferics intensities 2. Sferics location of fronts 3. Synoptic analysis 4. Alps**—*M.R.*

**4K–66** 551.501.8

Schindelhauer, E., **Über elektromagnetische Störungen.** [Electromagnetic disturbances.] *Elektrische Nachrichten Technik*, Berlin, 5(1):442–449, Sept. **1928.** 5 figs., table. **DLC**—Discusses the diurnal and annual course of direction, frequency and intensity of grinders and clicks at Potsdam detected by means of audio devices or the direction finder of WATSON-WATT. The results of ob servations are presented in graphical form. *Subject Headings:* **1. Sferics variations 2. Potsdam Germany.**—*A.A.*

**4K–67** 551.501.83:551.576.1:551.515.

*Schonland, B. J. F. (Univ. of Capetown), **The polarity of thunderclouds.** *Royal Society of London, Proceedings, Ser. A*, 118(779):233–251, March 1, **1928.** 10 figs., 6 tables. **DLC**—Several storms observed at Somerset East, 1926–27, gave no evidence that discharges within a thundercloud involve an upward movement of positive charge. The results of observations give strong support to CRAIB's conclusion that the polarity of the storms was positive. *Subject Headings:* **1. Sferics from thunderclouds 2. Thundercloud polarity 3. Somerset East, England.**—*W.N.*

**4K–68** 551.501.8

Watson-Watt, R. A., **The present state of our knowledge on atmospherics.** *Engineering*, London, 126(3275):496, Oct. 19, **1928.** **DLC**—An electrical discharge was defined as the destruction of electrical moment measured by the product of the quantity of electricity and the height transfer which it involved. Field changes resulting from this destruction were studied by means of cathode ray oscillographs. Shapes and magnitudes of 8000 wave forms were analyzed. Their aperiodic forms may be ascribed to incidents in propagation rather than to source but an explanation that holds for the mechanism remains to be given. Reference was made to U.S.S.R. work on sferics and the 10 kc/s intensity to radiate from storms at 3000 to 5000 km distance. The intensity was found to vary according to the inverse-square law. Seasonal and diurnal variations were discussed. *Subject Headings:* **1. Sferics wave forms 2. Sferics intensities 3. Sferics variations.**—*W.N.*

**4K–69** 551.594.11(98/9):551.515.

Whipple, F. J. W., **On the association of the diurnal variation of electric potential gradient in fine weather and the distribution of thunderstorms over the globe.** *Nature*, London, 122(3083):908 Dec. 8, **1928.** **DLC**—Thunderstorms are least frequent from 0200 to 0400 (when it is afternoon over the Pacific) and most frequent from 1400 to 1600 GMT (when it is afternoon in Africa and S. America). Observations of atmospheric potential gradient made in the Polar regions and over the oceans, where there is little systematic local variation in this element, show minima and maxima which fall within these same respective hours. This supports C. T. R. WILSON's hypothesis regarding the ionospheric link between thunderstorm (upward) currents and downward currents in areas of fine weather. *Subject Headings:* **1. Atmospheric potential gradient 2. Polar Regions 3. Oceans**—*M.R.*

## 1929

**4K–70** 551.501.8

Association Française pour l'Avancement des Sciences, **Compte Rendu de la 53e Session, Le Havre, 1929, 7e Section, Météorologie et physique du globe.** Paris, **1929.** p. 287–386. figs. refs. **DLC**—Pages 287–316 contain brief accounts of progress, techniques and results achieved in France in recording sferics. The principal papers are: R. Bureau: "Recent development of meteorological electricity measurement and its methods." P. Doury: "Recording of atmospherics at Saint Cyr." F. Schindelhauer: "Influence of the geomagnetic on atmospherics." Jean Lugeon: "Refraction and propagation of atmospherics in the troposphere." A. Viaut: "Atmospherics and air masses." E. Rougetet: "A particular case of sferics observed on short waves." *Subject Heading* **1. Sferics research.**—*G.T.*

**4K–71** 551.501.83:551.50

*Colwell, R. C., **Fading curves and weather conditions.** *Institute of Radio Engineers, Proceedings* 17(1):143–148, Jan. **1929.** 11 figs. **DLC**—Weather has a decided effect upon the signals from station KOKA (Pittsburg). It was possible to predict next day's weather from the sunset curve obtained with the aid of a Shaw recorder. A curve rising after sunset indicated a wet or cloudy day; a falling curve indicated a clear day. Of the thirty curves analyzed, 22 (17 on clear days and 5 on cloudy days) were irregular during daylight hours and of the remaining 8, 4 were taken on clear days and 4 on cloudy days. *Subject Headings:* **1. Weather forecasting from sferics 2. Twilight effect on sferics.**—*W.N.*

**4K–72** 551.501.83:551.515

Dean, S. W., **Correlation of directional observations of atmospherics with weather phenomena.** *stitute of Radio Engineers, Proceedings*, 17:1185–1191, 1929. **DLC**—Using a cathode ray direction der, the author obtained at Houlton, Maine, good correlation between direction of sferics and st moving low pressure areas from Texas (Sept. 12–20) or a tropical hurricane which was detected sferics 2 days before it appeared on the U. S. Weather Bureau maps. Storms at sea were also cated without previous knowledge from weather maps. A network of stations, or at least 3 along e Atlantic Coast to detect storms at sea, is recommended for and in forecasting. *Subject Headings:* **Sferics from cyclones 2. Sferics networks 3. Weather forecasting from sferics 4. Houlton, aine.**—*M.R.*

**4K–73** 551.594.7:551.501.83

Fuchs, J., **Die Sende- und Empfangsverhältnisse im Hochgebirge mit besonderer Berücksichtigung der atmosphärischen Störungen.** [Transmission and reception conditions in the high ountains, with special reference to atmospheric disturbances.] *Jahrbuch der Drahtlosen Telegraphie d Telephonie*, Berlin, 34(3):96–101, 1929. 5 figs. **DLC**—Observations of weather conditions ade at Sonnblick Observatory (3106 m) near Salzburg, Austria, are correlated with sending and ceiving conditions. Disturbances due to precipitation in the vicinity (drizzle, light, moderate d heavy rain, graupel, light and heavy snowfall) are classified according to the type or tone of ise heard in the receiver. Conditions in the mountains are similar to those on the plains but, cording to the author, the mountains are most suitable for research into sources of atmospheric sturbances. (*Same item as* 2K–97, Dec. 1951, *MAB.*) *Subject Headings:* **1. Mountain meteorogy 2. Sferics types 3. Radio transmission 4. Sonnblick, Austria.**—*C.E.P.B.*

**4K–74** 551.501.83 551.508.94

*Harper, A. E., **Some measurements of the directional distribution of static.** *Institute of Radio ngineers, Proceedings*, 17(7):1214–1224, July 1929. 8 figs., table, 3 refs. **DLC**—The results of is investigation are presented in curves featuring direction distribution April–Sept. and Dec., 28, and a table giving the principal thunderstorm areas from Houlton. Directional distribution sferics is a function of attenuation. Overland paths give weaker sferics than oversea paths. iurnal variation is the marked difference between day and night attenuation. Sferics accompany- g electrified clouds (young thunderstorms) seem to come from the SE edge of an advancing low, pecially when precipitation occurs. Two direction finders are described. The cathode ray rection finder was found to be superior. *Subject Headings:* **1. Sferics directional distribution Sferics direction finders 3. Cathode-ray oscillographs 4. Houlton, Maine.**—*W.N.*

**4K–75** 551.509.5:551.515.4:551.501.83

Lugeon, Jean, **La genèse des orages de chaleur et leur prévision à l'aide des atmosphériques.** Heat thunderstorm formation and its forecasting by sferics.] *Académie des Sciences, Paris, mptes Rendus*, 189(9):363–365, Aug. 26, 1929. diagr. **DLC**—The mechanism of heat thunderorm formation (as observed by the author in Zurich) and variations of sferics on thunderstorm days e described in detail. A schematic diagram illustrating the correlation between sferics (type, equency, intensity) and thunderstorm development throughout the day is presented. It is shown at heat thunderstorms occurring in the afternoon can be predicted at dawn by a sudden jump in the rve of sferics before sunrise. This jump occurs on thunderstorm days only and is caused by a ick stratified and electrified atmospheric layer between the altitudes 4500 and 6000 m. *Subject eadings:* **1. Thunderstorm formation 2. Thunderstorm forecasting from sferics 3. Heat thunderorms 4. Zürich, Switzerland.**—*G.T.*

**4K–76** 551.501.8 551.510.53

Lugeon, Jean, **Nouvelle méthode de sondage électromagnétique vertical et quasi-horizontal e l'atmosphère.** [New method of vertical and quasi-horizontal electromagnetic sounding of the mosphere.] *Archives des Sciences Physiques et Naturelles*, Geneva, 11:239–259, Sept./Oct. 1929. figs., table, 8 refs. **DLC**—A thorough and detailed account of the use of the atmoradiograph to otain soundings of the atmosphere up to the ionosphere and at great distances. Inversions in the wer atmosphere and at the tropopause, sources of sferics at 8000 km distance or more, and of gher ionospheric (auroral) layers of the atmosphere can be located by this method. *Subject eadings:* **1. Sferics soundings of atmosphere 2. Atmoradiograph soundings.**—*M.R.*

**4K–77** 551.501.83:551.594.22

Simpson, G. C., **The Kelvin lecture.** *Engineer*, London, 174:483–484, May 3, 1929. **DLC**—was established from cathode ray oscillograph observations that the main discharge in a lightning ash is an undirectional current that starts from zero, rises to maximum and decreases to zero. ightning as source of sferics (set forth by Appleton) explains the ripples by the oscillations within

the lightning channel. The energy associated with a discharge can be calculated and is $10^{17}$ erg for a flash discharging 20 coulombs. The average duration of a lightning discharge is greater tha 1/1000 sec. *Subject Headings:* **1. Lightning discharges 2. Sferics from lightning.**—*W.N.*

**4K–78** 551.594.7:629.1

†Smith-Rose, R. L., **Radio direction-finding by transmission and reception.** *Institute of Rad Engineers, Proceedings*, 17(3):425–478, March **1929.** 19 figs., 8 tables, 75 refs. **DLC**—This critic resume goes back to the early days and shows methods, instruments, observations and present result to further explain the various topics under discussion. The emphasis is on the application of directio finding to marine navigation; also valuable for radio meteorologists. A bibliography is appende *Subject Headings:* **1. Radio direction-finding 2. Marine navigation.**—*W.N.*

**4K–79** 551.501.8

**Static comes long distance.** *Science News Letter*, 15(424):327–328, May 25, **1929. DLC**— A popular presentation including theories and opinions of a number of research workers on the subje of sferics. The general belief that sferics originate in thunderstorms is emphasized and sourc like lows and rain are also considered. *Subject Heading:* **1. Sferics theory.**—*W.N.*

**4K–80** 551.509.1 551.594.6

Watson-Watt, R. A., **Weather and wireless.** *Nature*, London, 123(3100):500–501, March 3 **1929.** Also in: *Royal Meteorological Society, Quarterly Journal*, 55(231):273–301, July **1929.** figs. **DLC**—First article is a summary of a lecture containing brief statements on sferics. Mo sferics are said to be produced during summer afternoons. The full text takes up: 1) Tran mission of weather report and synoptic charts by radio. 2) The weather of wireless; effect of atmo pheric conditions on the propagation of radio waves. 3) Effect of weather on wireless, an accou of atmospherics, with charts showing relation to thunderstorms on July 6, 1927 and to front ar thunderstorms on July 1, 1927, and relations of signal strength to depressions and surfaces of di continuity. Effect of wireless on weather practically nil. *Subject Headings:* **1. Radio communicatio 2. Radio meteorology 3. Sferics sources 4. England.**—*C.E.P.B.*

**4K–81** 551.501.8

Yokoyama, Eitaro and Nakai, Tomozo, **A note on the directional observations on grinders i Japan.** *Institute of Radio Engineers, Proceedings*, 17(2):377–379, Feb. **1929.** 2 graphs. **DLC** The conclusions in an earlier paper still holds except for the night observations of grinders. It w found that the directional property became indistinct and disappeared. It is suggested that lon wave sferics received in England and in the U. S. are from countries in the tropical zone, and tho received in Japan came from the Dutch East Indies. The possibility exists that sferics originati in the tropical region of the U. S. are received in Japan as grinders early at night, and those originati in Africa late at night, whereas from the Dutch East Indies they are received around the cloc *Subject Headings:* **1. Long wave sferics 2. Japan.**—*W.N.*

## 1930

**4K–82** 551.594.7:551.501.83 551.594.

*Fuchs, J. and Scholz, J., **Untersuchungen über luftelektrische Phänomene und die atmo phärischen Störgeräusche der Radiotelegraphie.** [Investigations of atmospheric electricity ph nomena and atmospheric noises in radiotelegraphy.] *Beiträge zur Geophysik*, 27:176–216, **1930.** figs., 5 tables, refs. English summary p. 177–178. **DLC**—Measurements of atmospheric electrici made at the Sonnblick observatory (3106 m) show that the rapid changes of the potential gradient not have a direct relation to "click" disturbances. Up to a distance of 300 km, fronts and thund storms produce sferics independent on time of day. Sferics from distances of 300–1000 km we perceptible only at night. Grinders, which came from a distance up to 15 km, are explained b irregular glow discharges. The "notes" (hissing) are discharges from the antenna, which c increase in intensity up to a St. Elmo's fire. Measurements of the potential gradient by means the Wilson apparatus are affected by fog conditions. The instrumentation and results of observ tions are shown in detail. *Subject Headings:* **1. Atmospheric potential gradient measuremen 2. Sferics wave forms 3. Sonnblick, Austria.**—*A.A.*

**4K–83** 551.501

*Lugeon, Jean, **Le sondage simultané par les parasites atmosphériques à Zurich et au Saha** [Simultaneous sounding by means of sferics in Zurich and in the Sahara.] *Académie des Scienc Paris, Comptes Rendus*, 191:525–527, Sept. 29, **1930.** table, refs. **DLC**—Using 3 years of sfer records at Zurich in comparison with 500–3000 hours of records at Paris, Lausanne, Warsaw a El Golén (30°34′N, 0°33′E) in the Sahara, the author concludes that 20% of sferics come fr

1000 km, 70% from 100 to 1000 km, 10% from local sources (<100 km). Cold front thunderstorm as were located on Nov. 1–4 between New York and Florida and recorded at Paris, Zurich and Golén. Thus the signals carried >8000 km. It was concluded that the E layer was higher 15 km) at El Golén than at Zurich (98 km) as was also the ozone layer and the tropopause according the records obtained. *Subject Headings:* **1. Sferics from distant sources 2. Sferics distance quencies 3. Sferics soundings of atmosphere 4. Ionospheric height determinations.**—*M.R.*

## 1931

**4K–84** 551.508.94:551.501.81

Bureau, Robert, **Un radiogoniomètre enregistreur. Son application aux parasites atmosériques.** [A recording radiogoniometer. Its application to atmospheric parasites.] *Académie s Sciences, Paris, Comptes Rendus*, 192(3):170–172, Jan. 19, **1931.** 2 figs., 2 refs. **DLC**—A cording device is described which operates on the principle of the AUSTIN directional (rotating) tenna, combined with a neon light and a drum which rotates synchronously with the antenna; e record produced is illustrated. The marks on the photographic record sheet correspond with e time and direction of the sferics impulse which lights the neon lamp. The simple neon lamp gister was devised by IVO RANZI (*Nuovo Cimento*, 5:326, 1928). *Subject Headings:* **1. Radiooniometers 2. Sferics direction recorders. I. Ranzi, Ivo.**—*M.R.*

**4K–85** 551.501.8

Lugeon, Jean, **Sondowanie warstw atmosfery za pomoca obserwacji zakłocen pola eletromagnetycznego.** [Atmospheric soundings by means of sferics.] *Towarzystwo Geofizykow, Warsaw, iuletyn, Fasc.* 1, **1931.** 11 p. 17 refs. In Polish and French. **DWB**—A general summary of the story of sferics research, the work of the author and R. BUREAU in France in the application of erics to synoptic analysis and forecasting, and the invention of the atmoradiograph, the radioniometer, etc. to study sferics from thunderstorms, sand storms, etc. and ionospheric reflections sferics which permit soundings of distance of sources and height of reflecting layer. *Subject eadings:* **1. Sferics research 2. Sferics soundings of ionosphere 3. Atmoradiographs.**—*M.R.*

**4K–86** 551.594.7:016

†Parkinson, T.; Kirby, S. S.; Arnold, P. N. and others, **Bibliography on radiò wave phenomena nd measurement of radio field intensity.** *Institute of Radio Engineers, Proceedings*, 19(6):1034–084, June **1931. DLC**—The bibliography contains 630 annotated entries classified under subject nd related subdivisions in chronological order: radiation, radio wave phenomena, fading, daily and asonal variations, direction variations; meteorological, geophysical and cosmic effects; eclipses, flection, refraction, diffraction, absorption, polarization, K-H layer, wave front angle, transmission rmulas, atmospheric disturbances, strays, directional properties, etc. *Subject Heading:* **1. Radio ave propagation bibliographies.**—*W.N.*

**4K–87** 551.501.83

*Potter, R. K., **High frequency atmospheric noise,** *Institute of Radio Engineers, Proceedings*, (10):1731–1766, Oct. **1931.** 2 figs., 27 graphs, table, refs. **DLC**—The data under discussion ere based on measurements (at 5–20 Mc/s) of the peak noise values which stand out prominently ove the background level. The measurements taken at different U. S. locations at various times day and season showed that sferics are largely transmitted by high altitude paths. The effects sun, lightning, earth's magnetic field and other factors were included in the investigation. Atospheric noise generated by centers of electrical disturbances is inversely proportional to freuency. *Subject Heading:* **1. Short wave sferics.**—*W.N.*

**4K–88** 551.501.83:551.515

Watson-Watt, Robert A. and Bureau, Robert, **On the meteorological relations of atmospherics.** *oyal Meteorological Society, Quarterly Journal*, 57(239):221–237, April **1931. DWB**—Account of a iscussion at British Association, 1930. WATSON-WATT describes work of BUREAU (Paris), LUGEON Zurich) and especially British Radio Research group. BUREAU and LUGEON are criticized for lack quantitative research on atmospherics. Origin in thunderstorms, especially at cold fronts, and om great distances is emphasized. BUREAU's contribution to recording of atmospherics and search in France which brought out the opposite influence of different meteorological situations, nd the fundamental importance of diurnal variation, mixed origin and evolution is summarized. *ubject Heading:* **1. Sferics research. I. Lugeon, Jean.**—*W.N.*

## 1932

**4K–89** 551.501.83:551.515.4

Gherardi, W. R., **Work of U. S. Hydrographic Office in terrestrial magnetism and electricity.** *merican Geophysical Union, Transactions*, 13:157–158, June **1932. DLC**—Experimental observa-

tions and direction finding of thunderstorms as a function of associated sferics were conducted July and Aug. 1931 by the Bureau of Aeronautics of the Navy. Two cathode-ray radiogoniomete were employed at Lakehurst and Cape May, N. J. Local interference prevented determination static centers in about half of the cases observed but it was definitely established that both observ tion posts checked simultaneously the identical static flashes. Extended observations, includi an attempt to follow a storm across the U. S., are contemplated. Cathode-ray direction finde under construction at the Naval Research Lab. will be used in cross bearing observations of We Indian hurricanes, aiming at forecasting. *Subject Headings:* **1. Sferics thunderstorm detecti 2. Radiogoniometers.**—*W.N.*

**4K–90** 551.501.

*Jansky, Karl G. **Directional studies of atmospherics at high frequencies.** *Institute of Rad Engineers, Proceedings*, 20(12):1920–1932, Dec. **1932.** 14 figs., table, 7 refs. **DLC**—Data obtain by means of the automatic long wave (6936 m) recorder (described) revealed presence of: 1) stat from local thunderstorms, 2) from distant ones and 3) from an unidentified source. The latter, steady hiss-type sferic, was plotted against time and evidently was associated with solar activit *Subject Headings:* **1. Long wave sferics 2. Long wave recorders.**—*W.N.*

**4K–91** 551.590.24:551.501.83:551.510.5

Lugeon, Jean, **L'éclipse de soleil du 31 août 1932 et le sondage par les parasites atmosphérique** [Solar eclipse of Aug. 31, 1932, and soundings by means of atmospheric parasites.] *Académie d Sciences, Paris, Comptes Rendus*, 195:817–819, Nov. 7, **1932.** 3 figs. **DLC**—By comparing recor from sferics recorders installed by the author during the Polar Year at Jabłonna (near Warsaw), Tromsø, Norway and on Bear Island during the eclipse of Aug. 31, 1932, it is established in both positive and a negative manner that the grazing rays of the sun just striking the ionosphere mark t time of ending or beginning of strong sferics reception from sources thousands of miles distant. T sources in this case were from the U.S.A. and they were clearly received during eclipse only at Jabłon which lay in right geometric path for the eclipse influence to be felt, but not at the Norwegian Bear Island stations. The eclipse effect is similar to sunset effect. *Subject Headings:* **1. Sferi reflections from ionosphere 2. Sferics reception during eclipses 3. Eclipse effects on ionosphe 4. Jabłonna, Poland.**—*M.R.*

**4K–92** 551.594.7:551.501.

Munro, G. H. and Huxley, L. G. H., **Atmospherics in Australia. I.** *Australia. Council Scientific and Industrial Research, Bulletin*, No. 68, **1932.** 50 p. 13 figs., 2 tables, refs. Als *Australia. Radio Research Board, Report*, No. 5, **1932. DWB**—Paper describes progress of i vestigation of atmospherics which interfere with radio reception in Australia. Cathode-ray directi finders used are described. Regular observations of directions and intensities of individual atmo pherics, taken at two stations 300 mi apart, and their origins, at distances up to 1500 mi from statio are taken up. Diurnal and seasonal variations in the activity of atmospherics for over a year a described. (*Same item as* 4D–59, April 1953, *MAB.*) *Subject Headings:* **1. Sferics variatio 2. Radio reception 3. Australia.**—*H.P.K.*

**4K–93** 551.501.

Potter, R. K., **Frequency distribution of atmospheric noise.** *Institute of Radio Enginee Proceedings*, 20(9):1512–1518, Sept. **1932.** 3 figs., 8 refs. **DLC**—Relation between intensity a frequency of noise (sferics) was estimated and compared for low-frequency range (15–60 kc) in te of its effect on reception, and for high-frequency (2–20 Mc) by the peak method. The results distribution at midday and midnight, as well as at times of local thunderstorms, are presented curves. The region of high daytime attenuation agrees with that expected either from electr resonance in the presence of the earth's magnetic field or the normal attenuation change with fr quency for "ground" and "refracted" waves. *Subject Headings:* **1. Sferics frequency distributi 2. Sferics from thunderstorms 3. United States.**—*W.N.*

## 1933

**4K–94** 551.501.83:551.521.

Appleton, E. V. and Bowen, E. G., **Sources of atmospherics and penetrating radiation.** *Natu* London, 132(3346):965, Dec. 16, **1933.** fig., table, refs. **DLC**—Analysis of 407 coincident d charges as observed on quiet autumn days in SE England by means of a cathode-ray directi finder and a couple of Geiger-Müller counters shows that the number of coincidences between sfer and penetrating radiation is no greater than would be expected from a chance distribution. It possible that particles produced during a lightning discharge are of lower energy than those i mediately before the flash. The recordings were made from sources at 2000–3000 km. *Subj Headings:* **1. Sferics from lightning 2. Lightning discharges 3. Radiation.**—*W.N.*

4K–95 621.396

Dellinger, J. H.; Espenschied, L.; Ring, A. D. and others, **Report of committee on radio propaga-n data.** *Institute of Radio Engineers, Proceedings*, 21(10):1419–1438, Oct. **1933.** 15 graphs. LC—Radio wave propagation data, enabling quantitative evaluation of field intensities, and nitations resulting from atmospherics and man-made noises and fading over a frequency from 150 1700 kc/sec and up to an altitude of 5000 km are presented graphically. *Subject Heading:* **Radio wave propagation.**—*W.N.*

4K–96 551.506.5(98) 551.501.83:551.508.94

Lugeon, Jean, **Notice préliminaire sur l'Expédition Nationale Polonaise de l'Année Polaire 32–33 à l'Île des Ours.** [Preliminary note on the National Polish Expedition during the Polar ear 1932–33 to Bear Island.] *Towarzystwo Geofizykow, Warsaw, Biuletyn, Fasc.*, 7/8:43–96, **1933.** s., charts. **DWB**—A general description of Polish expedition to Tromsø and Bear Island during e second International Polar Year 1932–33. Among other things, the work done at Bear Island the field of radio atmospherics and the equipment, sites, etc. connected therewith, the atmo-diograph installation at Bear Island and the installation at Tromsø are described and illustrated. *ubject Headings:* **1. Polar Year stations, 1932–1933 2. Sferics research in Arctic 3. Sferics uipment 4. Atmoradiographs 5. Bear Island, Arctic.**—*M.R.*

1934

4K–97 551.501.83:551.594.22

Appleton, Sir E. V. and Chapman, F. W., **The lightning flash as a source of an atmospheric.** *ature*, London, 134(3399):968, Dec. 22, **1934.** fig., ref. **DLC**—The assumption that sferics iginate in lightning flashes was verified by similar wave forms of a group of three component sturbances and another of three discharges with a repeating time base of 0.005 sec duration. he 2 cathode ray oscillographic records are presented. *Subject Heading:* **1. Sferics from lightning.**—*N.*

4K–98 551.501.83(54)

*Chakravarti, S. P. and Paranjpye, B. H., **On atmospherics at Bangalore during the polar ar.** *Indian Institute of Science, Bangalore, Journal*, vol. 17, Pt. 1, 1934. 18 p. figs., tables, refs. **DLC**—Sferics in India are severe and prevalent throughout the year. Purpose of the sferics bservations at Bangalore was to compare the results with similar observations elsewhere. The sults presented graphically and numerically show that mean of hourly maximum disturbances aried from 40° to 105° E from true N and the constancy was greater in winter than in summer. he number of sferics per minute and per hour was higher in summer than in winter. Correlation as also found with magnetic disturbances and number of sunspots; also with the local temperature the day of observation and on the day before. *Subject Headings:* **1. Sferics data 2. Sferics urces 3. Bangalore, India.**—*W.N.*

4K–99 551.501.83

Douguet, —, **Quelques observations sur la propagation pendant l'année polaire au Scoresby und.** [Observations of propagation during the Polar Year at Scoresby Sound.] *L'Onde Électrique*, aris, 13(151):277–288, July **1934.** 5 figs., photos, map. **DLC**—A chapter on sferics is included . 286–288). It deals with diurnal and seasonal variations of sferics observed on the east coast of reenland (1932–1933). Only sferics originating in remote sources could be identified. They uld be observed between 9 p.m. and 9 a.m. during the polar night. There was practically no tivity during the polar day. *Subject Headings:* **1. Sferics variations 2. Scoresby Sound, Green-nd.**—*G.T.*

4K–100 551.501.83:551.509.5:551.515.4 551.508.94

Faillettaz, R., **Un nouveau procédé d'enregistrement des atmosphériques pour la prévision des ages.** [A new technique of recording sferics for thunderstorm forecasting.] *Académie des iences, Paris, Comptes Rendus*, 199(26):1647–1648, Dec. 26, **1934.** **DLC**—A radioelectric recorder sed at Tamanrasset during the Polar Year 1933 and re-installed for permanent use at Trappes bservatory is described. Electric charges produced by sferics are accumulated in a condenser and ischarged every minute into the recording unit. Directional reception can be obtained by the use f directional antennas. The fact that only nearby sources can be detected on short waves provides means of estimating distance. *Subject Headings:* **1. Sferics recorders 2. Thunderstorm fore-asting from sferics.**—*G.T.*

4K–101 551.501.83:551.515.4

Leushin, N. I., **O stratosfernom proiskhozhdenii radio-pomekh.** [The stratospheric origin of adio disturbances.] (In: Vsesoiuznaia Konferentsiia po Izucheniiu Stratosfery, Leningrad **1934,**

**Trudy,** (publ. 1935). p. 313–321. 3 refs., 5 figs.) **DLC.** English edition of **Trudy,** entitled: **Pr ceedings of the All-Union Conference for the Study of the Stratosphere.** Moscow, **1938. DLC**—T mean diurnal variation of atmospherics for each month of 1931 is computed on the basis of observ tions made by means of recording equipment in Slutsk on the wavelength 20,000 m. Curves a given for the maximum and separately for the E–W and N–S directions. The number of atm pherics is considerably smaller than in Potsdam. Polar diagrams show the diurnal and seasor frequency of directions. The direction of atmospherics at selected places in Europe and its s roundings is compared with a map of annual thunderstorm frequency. *Subject Headings:* **1. Diurn sferics variations 2. Sferics frequencies 3. Thunderstorm distribution 4. Slutsk, U.S.S. 5. Europe.**—*A.A.*

**4K–102** 551.501.

Lugeon, Jean, **Localisation à grande distance des foyers de parasites atmosphériques sa radiogoniomètre.** [Location of sources of atmospheric parasites from great distance witho radiogoniometer.] *Académie des Sciences, Paris, Comptes Rendus,* 199:1059–1061, Nov. 12, 193 2 figs., refs. **DLC**—The geometry of the graphical system used by the author to locate sources sferics (by noting the time of increase or decrease in sferics reception at sunset or sunrise, respectivel is described and illustrated on a chart for the North Atlantic and Europe, using data from Be Island and Warsaw as the basis for triangulation. *Subject Headings:* **1. Sferics source locati 2. Sferics from distant sources.**—*M.R.*

**4K–103** 551.501.83(98/

Lugeon, Jean, **Les parasites atmosphériques polaires.** [Polar atmospheric parasites.] *Ac démie des Sciences, Paris, Comptes Rendus,* 198:1712–1714, May 7, **1934.** fig. **DLC**—Comparis of diurnal and seasonal frequencies of sferics received at Bear Island, Tromsø and Jabłonna (ne Warsaw) during the Polar Year shows that the reception during the polar day twilight or nig substantiates the author's theory of the twilight effect on the ionosphere and hence on its reflecti power for sferics sources from a great distance during the ordinary day and night. In summ however, an unexplained high frequency of sferics was recorded in the Polar Region. *Subj Headings:* **1. Sferics in polar regions 2. Sferics reflections from ionosphere 3. Sferics theo 4. Bear Island, Arctic.**—*M.R.*

**4K–104** 551.501.

Munro, G. H. and Webster, H. C., **Nature of atmospherics.** *Nature,* London, 134(3397):88 897, Dec. 8, **1934.** fig. **DLC**—The average time of the order of milliseconds for the duration sferics as observed by several workers evidently was taken with time bases permitting only one of t constituent pulses to be observed. The order of 0.2 to 0.5 sec. (occasionally longer) includes t whole succession of pulses, i.e., the duration as it appears to a radio listener and as it was observ from cloud to cloud flashes by the authors. *Subject Heading:* **1. Sferics pulse duration.**—*W.N.*

**4K–105** 551.501.83:551.5

*Nakai, Tomozo, **Correlation of radio atmospherics with meteorological conditions.** *Paci Science Congress, 5th, British Columbia, 1933, Proceedings,* vol. 11. p. 1075–1081, 1934. p. 164 6 tables, 10 refs. **DLC**—Sferics disturbing the 30 kc/s signals were studied from April 1927 March 1928 and from Aug. 1928 to July 1929 at Isohama (town), Japan. Marked correlations wi lines of discontinuity, typhoons, rainfall and snowfall are tabulated. The difference in direction sferics from T. NAKAGAMI's (at Osaka) and J. OBATA's observations (at Tokyo) may be due different locations. Sferics seem to be associated with rapidly moving fronts or cyclones and wi deep (<740 mm) typhoons and not with slowly moving or higher pressure systems. They are oc occasionally associated with snowfall or with rain of a non-thunderous nature. It is difficult tell whether or not the direction of sferics coming from cyclones, typhoons, etc. is affected by thund storms produced over the mountains in connection with these disturbances. *Subject Headin* **1. Sferics data 2. Sferics sources 3. Japan.**—*W.N.* & *M.R.*

**4K–106** 551.594.2

*Norinder, Harald, **On the nature of lightning discharge.** *Franklin Institute, Journal,* 218(6 717–738, Dec. **1934.** 21 figs., 3 tables, 5 refs. **DLC**—Observational results (1930–1933) of 2 lightning discharges from 13 storms within a distance of 16 km are presented. An improved catho ray oscillograph, features of which are outlined, was used. The maximum field change in part discharges is expressed in volt/m/sec and plotted against the distance between observation s and the lightning path. The values permit approximate determination of the limit of variation the maximal field. *Subject Headings:* **1. Cathode-ray oscillographs 2. Lightning discharge data.** *W.N.*

4K–107 551.501.83:551.515.2

**Static from hurricanes may aid in locating them.** *Science News Letter*, 26(700):151, Sept. 8, 1934. **DLC**—G. W. KENRICK's immediate object was to perfect equipment to distinguish between sferics from hurricanes and other sources, while the joint research program of the Universities of Puerto Rico and Florida was getting started. *Subject Heading:* **1. Hurricane forecasting from sferics. I. Kenrick, G. W.**—*W.N.*

1935

4K–108 551.594.7 551.501.8

Bonch-Bruevich, M. A., **Rol' elektromagnitnykh voln dlia izucheniia atmosfery.** [Significance of electromagnetic waves for the study of the atmosphere.] (In: Vsesoiuznaia Konferentsiia po Izucheniiu Stratosfery, Leningrad 1934, **Trudy,** Moscow, **1935.** p. 269 282. 6 figs., 4 eqs.) **DLC.** English edition, *ibid.*, entitled: **Proceedings of the All-Union Conference for the Study of the Stratosphere.** Moscow, **1938. DLC**—A general review on atmospherics caused by tropospheric and stratospheric disturbances, on radio location of cyclones and fronts in the Arctic, basic theory of propagation, radio echoes, etc. Soviet studies in this field were made especially in the polar regions. *Subject Headings:* **1. Radio wave propagation 2. Sferics 3. Arctic.**—*A.A.*

4K–109 551.501.83

Henderson, J. T., **Direction finding of atmospherics.** *Canadian Journal of Research, Sec. A*, 13(2):34 44, Aug. **1935.** 3 figs., table, 6 refs. **DLC**—Observations of individual sferics were taken 57 days (May 25 to Aug. 7) at 11 h at Rockcliffe, six miles from Ottawa. The principal directions were plotted on the weather map featuring the directions through or close to a low. Sferics apparently originate in low pressure and thunderstorm areas. The cathode ray direction finders used in these observations have an accuracy of −1°. (*Same item as* 2H–9, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics directional distribution 2. Sferics direction finders 3. Canada.**—*W.N.*

4K–110 551.501.83:551.509.5:551.515.4

Hutchins, Kennan M. (*Neekah, Wis.*), **Radio static forecasts thunderstorms.** *American Meteorological Society, Bulletin*, 16(3):74–75, March **1935. MH-BH**—The writer claims to be able to forecast location and movement of thunderstorms by noting the intensity of the sferics in comparison with the intensity of reception of nearby radio stations, and by consecutive observations of intensity and frequency of sferics to give indication of whether storm is moving away or towards the receiver, and whether or not is is increasing or dying out. Old storms with cloud to cloud flashes and newly active thunderstorms give characteristic types of sferics. (*Same item as* 2H–10, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics types 2. Sferics location 3. Thunderstorm forecasting from sferics.**—*M.R.*

4K–111 551.501.83:551.509 551.508.94

†Lugeon, Jean, **Sur la necessité d'une station polaire permanente d'observations radiométéorologiques pour les services de prévision du temps, suivi d'un appendice donnant la déscription sommaire des atmoradiographes et radiogoniographes.** [The necessity of a permanent polar station for radiometeorological observations for weather forecasting, with an appendix giving a general description of atmoradiographs and radiogoniographs.] Warsaw, **1935.** 96 p. 65 figs., 2 fold. plates, biblio. p. 93–95. **DLC**—This carefully prepared review is a principal source of information on sferics research as applied to weather forecasting. The appearance and regime of "atmospheric parasites" in relation to fronts and thunderstorm regions is described for the North Atlantic and Europe, emphasizing observations in the Arctic. The author's network reached from 30°N to 75°N (Bear Island). The effect of auroras is shown and the detection of polar and subpolar atmospherics discussed. A "terminatogram" is proposed, giving the time of sunrise and sunset for all points of the ionosphere on the whole earth. A program for a polar radiometeorological station is outlined. The appendix presents circuit diagrams, photos, a detailed description of the necessary equipment and a list of 37 papers by the author between 1920 and 1934. *Subject Headings:* **1. Radio meteorology 2. Sferics research 3. Sferics networks 4. Weather forecasting from sferics 5. Sferics equipment. I. Poland. Panstwowy Instytut Meteorologiczny.**—*A.A.*

4K–112 551.501.83

Rao, N. S. Subba, **Nature of atmospherics.** *Nature*, London, 136(3443):683, Oct. 26, **1935.** fig., 4 refs. **DLC**—Sferics were studied in relation to broadcasting in the tropics. The curves obtained during severe sferics in Oct.–Nov. 1934 by means of a tuned receiver and a galvanometer of 1 sec, revealed thickening or dats. These features indicate the existence of gross (dats) and fine structure of sferics; the former possibly due to lightning flashes succeeding each other at millisecond intervals. An enlarged reproduction of a curve is presented. *Subject Heading:* **1. Sferics structure.**—*W.N.*

4K–113 551.501.83:551.594.22

Schonland, B. F. J., **Atmospherics and lightning.** *South African Journal of Science*, 32:24–31, Nov. 1935. **DLC**—The nature and sources of sferics, and research on the subject carried out by several workers (named) were treated generally in this lecture before the 33rd annual meeting of the South African Assoc. for the Advancement of Science. Australian workers, while on a voyage in the Indian Ocean, located the watershed of the Zambesi and the Congo as source of the sferics observed. This area is known to be the most thundery portion of the globe in the southern summer. The contemplated research in S. Africa is outlined and discussed. *Subject Headings:* **1. Sferics research 2. Sferics origin 3. Sferics from lightning 4. Africa.**—*W.N.*

## 1936

4K–114 551.501.83:621.396.663

Bent, Arthur E., **Some recent papers on radio atmospherics and direction finding.** *American Meteorological Society, Bulletin*, 17(3):75–78, March **1936.** 10 refs. **DLC, MH-BH**—A review (radiogoniometry). (*Same item as* 2H–11, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radiogoniometry 2. Sferics research.**

4K–115 551.501.83:551.508.94

Boswell, R. W., **Sources of atmospherics over the Tasman Sea.** *Australia. Council for Scientific and Industrial Research, Bulletin*, No. 100:42–46, **1936.** 2 figs., 2 tables, 4 refs. *Australia. Radio Research Board, Report* No. 10. **DWB**—Position and movement of thunderstorms was determined during Sept. 1932 by means of a cathode ray direction finder, operating at Auckland and a narrow sector directional recorder situated at Canberra. Results of the observations are tabulated and discussed especially in respect to the efficiency of the method. It appears that automatic recorders are capable of tracing thunderstorms over distances of up to 1500 mi. *Subject Headings:* **1. Sferics thunderstorm detection 2. Sferics recorders 3. Cathode-ray direction finders 4. Tasman Sea.**—*G.T.*

4K–116 551.501.83:551.515

Boswell, R. W. and Wark, W. J., **Relations between sources of atmospherics and meteorological conditions in Southern Australia during October and November 1934.** *Royal Meteorological Society, Quarterly Journal*, 62(267):499–527, Oct. **1936.** 7 maps, 19 refs. **DLC**—Research work on sferics in other countries is reviewed. Observations conducted in Australia to investigate correlation between sferics and meteorological conditions are graphically presented and discussed. It was found that correlation between sferics on one hand and thunderstorms and fronts on the other does exist. The value of thunderstorm location to air traffic is pointed out. *Subject Headings:* **1. Sferics research 2. Sferics sources 3. Southern Australia.**—*W.N.*

4K–117 551.501.83

†*§Bureau, Robert, **Les foyers d'atmosphériques.** [Sources of sferics.] *France. Office National Météorologique, Mémorial*, No. 25, **1936.** 94 p. 73 figs., bibliog. p. 93–94. **DLC**—This is the most complete monograph on sferics published to date. Records, statistical compilations, directional records, recorders, theory, diurnal variations, wave lengths, nocturnal sferics, diurnal change of direction, characteristics of graphic records, winter and summer sferics, migratory sources and, finally, analysis of particular cases and their use in prediction are treated in text, tables, graphs, schematic diagrams and reproduced recorder records. The use of polar diagrams in sferics location and to delineate storm or frontal areas is illustrated in detail. The world distribution of sferics sources is vividly and simply illustrated. *Subject Headings:* **1. Sferics sources 2. Sferics from air masses 3. Sferics recorders 4. Sferics data 5. Sferics bibliographies.**—*M.R.*

4K–118 551.501.83

Centkiewicz, Cz. and Starnecki, B., **Trzaski atmosferyczne.** [Sferics.] *Poland. Panstwowy Instytut Meteorologiczny, Wiadomości Meteorologiczne i Hydrograficzne*, 16(4/6):57–60; 16(10/12):93–107, **1936.** 22 figs., 18 refs., eqs. **DLC**—Deals with the forms of sferics and their mathematical representation with some results of observations and a detailed description of the equipment used with circuit diagrams. *Subject Headings:* **1. Sferics wave forms 2. Sferics theory 3. Sferics equipment.**—*A.A.*

4K–119 551.501.83:551.594.22

Coursey, Philip R., **Lightning and atmospherics.** *Nature*, London, 138(3490):509, Sept. **19, 1936. DLC**—The type of sferics as observed by Fyson (*see* 4K–120 below) may be ascribed to the rare form of thunderstorms that give a long crackling noise followed by the final crack of the sparkover, which naturally is observed visually. The phenomenon may arise from initial priming discharges. *Subject Heading:* **1. Sferics from lightning.**—*W.N.*

**4K–120** 551.501.83:551.594.22

Fyson, P. F., **Lightning and atmospherics.** *Nature*, London, 138(3485):278, Aug. 15, **1936.** **DLC**—Brief note on a sferics crackle heard before seeing the producing flash. This may be ascribed o an intermittent discharge preceeding the main flash or to slow reaction of the human eye. *Subject Heading:* **1. Sferics from lightning.**—*W.N.*

**4K–121** 551.515.4 551.501.83

Laby, T. H. and others, **Discussion on thunderstorm researches.** *Royal Meteorological Society, Quarterly Journal*, 62(267):507–527, Oct. **1936.** 7 figs., 12 refs. **DLC**—A number of prominent vorkers contributed to the discussion during the meeting of the Society, June 1936. Following opics were discussed: origin of the Australian Research Board, structure of lightning discharges, heories of thunderstorms, thunderstorm areas, location of sources of sferics by wireless direction inding, wave form of sferics, sferics and meteorology, sferics from lightning, energy and intensity f sferics and experimental methods of Australian observations. It was suggested that meteorologists dopt a nomenclature for thunderstorms comprising all aspects known. *Subject Headings:* **. Thunderstorm research 2. Sferics.**—*W.N.*

**4K–122** 551.506.5(98) 551.501.83

*Lugeon, Jean; Centkiewicz, Czesław and Łysakowski, Władysław, **Wyniki spostrzezen Polskiej Vyprawy Roku Polarnego 1932/33 na Wyspie Niedzwiedziej. III. Trzaski atmosferyczne. Résultats des observation de l'expédition Polonaise de l'Année Polaire 1932/33 à l'Île des Ours. II. Parasites atmosphériques.** [Results of observations carried out by the Polish Expedition to Bear Island, Polar Year 1932/33. III. Atmospheric parasites.] Warsaw, Panstwowy Instytut Meteorologiczny, **1936.** 9+p. 2 figs., append. 21 plates, 3 tables. In Polish and French. **DWB**—The detailed final report describing the installations at Jabłonna (Poland), Tromsø and Bjornaya (Bear Island) in 1932–33, and showing records from the atmoradiographs and mean monthly values or the 24 hours of the day at those stations and at Warsaw. Numerous photographs, graphs, ecords and tables are appended. The effect of clouds, ice fog and blowing snow was noted. Particularly impressive comparisons are made superimposing the Jabłonna and Bear Island daily records or the period Aug. 1932–Aug. 1933. *Subject Headings:* **1. Sferics data 2. Sferics research . Sferics equipment 4. Polar Year data, 1932–1933 5. Bear Island, Arctic 6. Jabłonna, Poland.**—*M.R.*

**4K–123** 551.501.83:551.577

Morgan, Howard K., **Rain static.** *Institute of Radio Engineers, Proceedings*, 24(7):959–963, uly **1936. DLC**—The difference between rain or snow static and sferics (lightning static) can be etermined by a pilot in flight by the nature of the noise. Precipitation static usually gives a ontinuous hum or roar whereas thunderstorm static is sharp and intermittent. Sand static occurs uring dust storms and snow static when blizzards (blowing snow at the earth's surface) occur. auses of such static and methods of avoiding or preventing it are discussed. Precipitation static sually occurs in flight due to the trailing antenna. Other forms may occur either in flight or at round stations. *Subject Headings:* **1. Precipitation static 2. Sferics from precipitation 3. Aeronautical meteorology.**—*M.R.*

**4K–124** 551.594.6

Munro, G. H., Wark, W. J. and Higgs, A. J., **Characteristics and distribution of sources of mospherics.** *Australia. Council for Scientific and Industrial Research, Bulletin*, No. 100:31–41, **936.** 4 figs., table, 6 refs. *Australia. Radio Research Board, Report* No. 10. **DWB**—Analysis one year's charts obtained with the sferics recorder installed at Mount Stromlo, Canberra, shows at sferics recorded on a frequency of 10 kc/sec are from two main types of sources: 1) tropical understorm areas ranging in distance from North Queensland to Africa and 2) sources of lower tivity, showing no regularity in time or place of occurrence. *Subject Headings:* **1. Long wave erics 2. Sferics source distribution 3. Canberra, Australia.**—*From author's abstract.*

**4K–125** 551.501.83:551.501.81

Munro, G. H., Wark, W. J. and Higgs, A. J., **Observations of atmospherics with a narrow sector rectional recorder at Canberra.** *Australia. Council for Scientific and Industrial Research, Bulletin* o. 100:19–30, **1936.** 4 figs., 9 refs. *Australia. Radio Research Board, Report* No. 10. **DWB**—ypical records of sferics obtained at Canberra during the period 1931–1932 are reproduced. Method recording is described. The charts are analyzed as to location, time variations and dependence of urces on weather. *Subject Headings:* **1. Sferics recorders 2. Canberra, Australia.**—*G.T.*

**4K–126** 551.501.83

*Munro, G. H., Webster, H. C. and Higgs, A. J., **Simultaneous observations of atmospherics th cathode ray direction-finders at Toowoomba and Canberra, Australia.** *Australia. Council*

*for Scientific and Industrial Research, Bulletin*, No. 89:1–42, **1935.** 15 figs., 7 tables, 44 refs. Also *Australia. Radio Research Board, Report*, No. 8. And *Ibid.*, No. 100, **1936. DWB**—Results obtained by an expedition to Toowoomba, Queensland, are given. Simultaneous observations o directions of sferics at Toowoomba and Canberra produced locations of their sources. Methods o observation, site errors, etc. discussed; results give: intensities, night observations, distribution o sources, correlations with thunderstorms, general meteorological conditions associated with sources etc. Another paper by W. J. Wark on "Atmospheric interference with reception" follows (p. 43–61 3 figs., 9 tables, 28 refs.). He discusses origin and nature of sferics in Australia, calculation of th hours and degree of interference, etc. Further papers on sferics may be found in *Bulletin* No.100 as follows: Munro, G. H., Wark, W. J. and Higgs, A. J., "Observations of atmospherics with a narrow sector directional recorder at Canberra." And: Boswell, R. W., "Sources of atmospheric over the Tasman Sea." (*Same item as* 4D–79, April 1953, *MAB.*) *Subject Headings:* **1. Sferic data 2. Radio reception 3. Australia. I. Wark, W. J. II. Boswell, R. W.**—*H.P.K.*

**4K–127** 551.501.83:551.594.22

*Norinder, H. (*Uppsala Univ.*), **The relation between lightning discharges and atmospheric in radio reception.** *Franklin Institute, Journal*, 221(5):585–611, May **1936.** 19 figs., 5 eqs. **DLC**—Analysis of simultaneous recording of thunderstorm sferics with oscillograph and radio loudspeaker showed that the characteristic variation form is of the same type as observed in lightning discharges *Subject Headings:* **1. Sferics from lightning 2. Oscillograph records.**—*W.N.*

**4K–128** 551.501.8

Rajam, C. V., **Wave forms of atmospherics at Madras.** *Nature*, London, 138(3503):106 Dec. 12, **1936.** fig. **DLC**—The observed types are divided into far-off and local lightning sferic various noises such as "clicks" and "frying" are heard day and night, respectively. The diurn variation of sferics is given. *Subject Headings:* **1. Sferics wave forms 2. Sferics types 3. Sferi from lightning 4. Madras, India.**—*W.N.*

**4K–129** 551.501.83:551.515

*Schonland, Basil F. J. and Hodges, D. B., **The relation between thunderstorms and atmospheri in Southern Africa.** *Royal Society of South Africa, Transactions*, 24, Pt. 2:81–92, **1936.** fig., tables, refs. **DLC**—The preliminary investigations with the aid of cathode ray direction finder a single Cape Town station had a range of 350 to 1000 mi. This was found by aid of weather map from which 65% of the thunderstorms indicated were detected from the associated sferics. T observations lasted 26 days of Sept.–Oct. 1935. It was found that lightning is the main source sferics and sferics over the Indian and Atlantic Oceans are related to oceanic lows. Detailed da are tabulated. *Subject Headings:* **1. Sferics data 2. Sferics sources 3. Sferics thunderstor detection 4. South Africa.**—*W.N.*

**4K–130** 551.501.83:551.508.

Wark, W. J., Boswell, R. W. and Webster, H. C., **A directional recorder for atmospheri** *Australia. Council for Scientific and Industrial Research, Bulletin*, No. 100:9–18, **1936.** 6 fig 6 refs., eqs. *Australia. Radio Research Board, Report* No. 10. **DWB**—A modified recorder illustrated in block diagrams and a description of its operation is given. The recorder, as used conjunction with two other recorders of the British Radio Research Board, is assumed to supp remaining data necessary for tracing the entire path of sferics across the Australian Bight. *Subj Headings:* **1. Sferics recorders 2. Australia.**—*W.N.*

**4K–131** 551.501.83:551.5

Weil, Joseph, **The locating of tropical storms by means of associated static.** *Florida. U versity. Engineering Experiment Station, Bulletin*, No. 3, Oct. **1936.** 21 figs., tables, 6 refs. **DLC** Sferics associated with a hurricane 2000 mi off Gainesville were observed July 1936 with the aid o modified radiogoniometer as developed by WATSON-WATT (1926). The composite photograp taken every 15 minutes from 6 p.m. to 8 a.m., were analyzed in order to determine whether any could be found in direction of the hurricane. The results showed ray-h, x, y and z of which former (h) seemed to be most likely associated with the storm observed; the latter (x,y,z) may ascribed to thunderstorms. It is concluded that the rays generally gave indication of the sto center but it cannot be said for sure that sferics emanate from all tropical disturbances. The metl is promising and would gain by triangulation. *Subject Headings:* **1. Sferics hurricane detect 2. Radiogoniometers 3. Tropical storms.**—*W.N.*

## 1937

**4K–132** 551.501

*Appleton, E. V. and Chapman, F. W., **On the nature of atmospherics—IV.** *Royal Societ London, Proceedings*, 158(893):1–22, Jan. 1, **1937.** 6 figs., 5 refs., 7 eqs. **DLC**—Evolution of sfe

is discussed. Sferics are produced from temporal variation of thunderstorm charge (generally aperiodic). The majority of net changes of field are stepwise; each step occurs with decreasing relative frequency as is the case with the grouping of sferics of distant origin. *Subject Headings:* **1. Sferics from thunderstorms 2. Sferics theory.**—*W.N.*

**4K–133** 621.396 551.501.83:551.515.4

†*Arkhan'gel'skiĭ, B. F., **Rasprostranenie radiovoln v severnykh shirotakh.** [Propagation of radio waves in northern latitudes.] *Leningrad. Arkticheskiĭ Nauchno-Issledovatel'skiĭ Institut, Trudy*, 78:17–20, **1937.** 5 figs. English summary p. 20. Also: similar title by Arkhan'gel'skiĭ, B. F. and Pabo, N. W. *Ibid.*, v. 124, **1938.** 88 p. 7 tables, 46 refs. **DLC**—Report on observations made in 1932/33 on Franz-Joseph Land, measuring the intensity of radio waves in the 20–2000 m bands, transmitted from stations at a distance from 2500 to 10,000 km. The influence of ultraviolet and corpuscular solar radiation during the polar day and night is discussed. The relation of sferics to the main regions of thunderstorm activity, presented on a map, is shown. The second article, Chap. VI (p. 80–85, 6 figs., 4 refs.) entitled **"Atmospheric noise in high latitudes,"** gives data for 1932–35 on diurnal and seasonal variation in atmospherics and relation to wave length as recorded in Franz Joseph Land. *Subject Headings:* **1. Radio wave propagation 2. Sferics sources 3. Sferics variations 4. Arctic Regions 5. Franz Joseph Land. I. Pabo, N. W.**—*A.A.*

**4K–134** 551.510.535:551.515.4

Bhar, J. N. and Syam, P., **Effect of thunderstorms and magnetic storms on the ionization of the Kennelly-Heavyside layer.** *Philosophical Magazine*, 23(155):513–528, **1937. DLC**—It was expected that thunderstorms or lightning discharges might affect the ionosphere (E region) at a distance of not less than 40 or more than 200 km (assuming the height of the E layer as 80 km). Records from Bombay of the disturbances of the E layer ionization were compared and statistically checked against records of thunder or lightning at Alipore Univ., Calcutta and other places about 100 km west of Calcutta to see if there was any positive correlation. A marked association was found between thunderstorms and abnormal increases in E layer ionization, but little relation between magnetic disturbances and E layer ionization or thunderstorms. The mechanism is described. *Subject Headings:* **1. Thunderstorm effects on ionospheric E layer 2. E layer ionization 3. Calcutta, India.**—*M.R.*

**4K–135** 551.501.83 551.594

Bureau, Robert, **Electricité atmosphérique et parasites atmosphériques.** [Atmospheric electricity and atmospheric parasites.] *International Union of Geodesy and Geophysics. Association of Terrestrial Magnetism and Electricity, Bulletin*, No. 10:429 436, **1937.** 2 figs., table. **DLC**—Registry of atmospherics involves incidental recording of local "parasites" or atmospherics which are often due to charges on the antenna induced by strong electric fields. Proper interpretation of records to determine sources of sferics at great distances (ca. 1500 km) would involve discrimination as to nature of disturbance shown by record. Examples are presented. *Subject Headings:* **1. Sferics records 2. Static from local sources.**—*M.R.*

**4K–136** 551.501.83:551.576.1:551.515.4

Chapman, F. W., **Atmospheric disturbances due to thundercloud discharges.** *Nature*, London, 139(3521):711–712, April 24, **1937. DLC**—Records as obtained on an improved cathode ray oscillograph show examples of complete sequences of atmospherics during a thundercloud discharge. *Subject Headings:* **1. Sferics from thunderstorms 2. Cathode-ray oscillographs.**—*W.N.*

**4K–137** 551.501.8:551.510.535

Laby, T. H.; Nicholls, F. G.; Nickson, A. F. B. and others, **Reflection of atmospherics at an ionized layer.** *Nature*, London, 139(3524):837 838, May 15, **1937.** figs., table, 6 refs., eqs. **DLC**—Hundreds of sferic wave forms were analyzed. More than twenty showed pulses seemingly reflected from 78–82 km above the earth. Intervals of time, distance of flash and height of layer were calculated. The fundamental frequency of the sferic pulse was $10^2$ cycles/sec in which case reflection occurs when ionization reaches 1 electron per $cm^2$. *Subject Headings:* **1. Sferics wave forms 2. Sferics reflections from ionosphere.**—*W.N.*

**4K–138** 551.508.94

Lutkin, F. E., **A drum camera for recording transient electrical phenomena.** *Journal of Scientific Instruments*, 14(6):209–212, June **1937.** 3 figs. **DLC**—The large diameter rotating drum carries the recording paper on which the wave forms of sferics are registered as departures from a closely pitched helical zero line. This camera used in conjunction with a cathode ray tube permits better resolution of the wave form. Periods up to 1/10 sec are recorded continuously. Brief description of the device is given. *Subject Headings:* **1. Sferics wave form recorders 2. Photographic spherics recorders.**—*W.N.*

**4K–139** 551.594.7

Flórián, Endre, **Az időjárás és a rádiévétez.** [Weather and radio reception.] *Időjárás*, 41(1/2):16–20, Jan./Feb. **1937.** 8 figs. German summary p. 49. **DLC**—The effect of atmospheric phenomena on radio wave propagation in general and on static in particular are discussed. Various types of sferics, caused by different electric discharges, are described. The possibility of using sferics for aerological research is suggested. *Subject Headings:* **1. Sferics wave forms 2. Radio wave propagation.**—*G.T.*

**4K–140** 551.508.94:551.501.83

Roberts, N. H., **A device for the superposition and simultaneous delineation of two wave-forms on a single cathode ray oscillograph screen.** *Royal Society of South Africa, Transactions*, 24, Pt. 4:325–330, **1937.** 3 figs., 5 refs. **DLC**—The device is described and illustrated in block diagrams. The high frequency permits the superposition and seems promising. Slight differences in wave form will easily show up on the screen and record. *Subject Headings:* **1. Cathode-ray oscillographs 2. Sferics wave form recorders.**—*W.N.*

**4K–141** 551.501.83:551.594.6

†*Schindelhauer, F., **Die Luftstörungen der drahtlosen Telegraphie.** [Static on the wireless telegraph.] *Germany. Reichsamt für Wetterdienst, Wissenschaftliche Abhandlungen*, 3(5), **1937.** 29 p. 12 figs., bibliog. covering 1926–1937, p. 24–29. **DLC**—Results of observations begun at Potsdam in 1926 are summarized and analyzed to show seasonal, diurnal (and twilight effects), 27 day (solar) period, direction of sources (daily change in direction at Potsdam compared with that at Lerwick and Abukir, by seasons), types of disturbances (which may occur simultaneously), etc. An impressive monograph of a complex statistical nature. It is recognized that not all sferics are from lightning sources; some may be due to ionospheric disturbances. *Subject Headings:* **1. Sferics bibliographies 2. Sferics data 3. Sferics sources.**—*M.R.*

**4K–142** 551.501.83:551.594.6

*Watson-Watt, R. A.; Herd, J. F. and Lutkin, F. E., **On the nature of atmospherics—V.** *Royal Society of London, Proceedings*, 162(909):267–291, Sept. 15, **1937.** 11 figs., 6 tables, 6 refs. **DLC**—Extensive series of observations conducted in the Red Sea, Indian Ocean, Egypt and in Anglo-Egyptian Sudan with control observations in SE England are presented in tabular form. The discussion is concerned with two main series of observations, wave forms of which were recorded photographically at the two ends of a 560 km base line. Principal characteristics of the dual wave form are plotted against distances up to 4000 km and oscillatory component and slow form characteristics discussed. A "precursor" of small amplitude was found associated with discontinuities in the leader stroke as admitted by SCHONLAND and others. *Subject Headings:* **1. Sferics data 2. Sferics wave forms.**—*W.N.*

## 1938

**4K–143** 551.501.83

Bureau, Robert, **L'application de l'étude des parasites atmosphériques à la météorologie** [Application of the study on atmospheric parasites to meteorology.] *Le Génie Civil*, Paris, 113(11) 226–229, Sept. 10, **1938.** 11 figs. **DLC**—A simple technical explanation of the effect of the ionosphere on radio and sferics propagation. The diurnal variation in sferics is shown to be simple (night maximum) in winter and complex (maximum in afternoon and at midnight) in summer. The effect of wave length of sferics shown to be variable, but two stations at great distances show almost identical diurnal curves (27 kc/sec) at same wave length. Directional recording equipment (radiogoniometers) and records made at Paris show variation of centers of sferics throughout the day. *Subject Headings:* **1. Radiogoniometers 2. Sferics records 3. Diurnal sferics variation 4. Paris, France.**—*M.R.*

**4K–144** 551.515.4:551.501.8

Bureau, Robert, **Centres of thunderstorms and "centres" of sources of atmospherics.** *Royal Meteorological Society, Quarterly Journal*, 64:331–335, **1938.** 3 figs., 2 refs. **DLC**—Author feels that a fairly reliable relationship exists. (*Same item as* H–68, Aug. 1950, *MAB.*) *Subject Heading* **1. Sferics from thunderstorms.**—*M.P.K.*

**4K–145** 551.501.83:551.509.5:551.515.

Faillettaz, R., **Enregistrements d'atmosphériques et prévision des orages.** [Recording c sferics and thunderstorm forecasting.] *Académie des Sciences, Paris, Comptes Rendus*, 206:270–271 **1938. DLC**—Results of 14 months' recording of atmospherics are summed up. The daily course c the activity of sferics shows total absence during daytime (unless there is a thunderstorm) and generally, erratic pattern at night, with many scattered maxima. The apparatus used (*see ite*

4K–100 same author, 1934, C.R. p. 1647) was found adequate for determining the general direction of thunderstorms. *Subject Headings:* **1. Thunderstorm forecasting from sferics 2. Sferics recorders.**—*G.T.*

**4K–146** 551.508.94:551.501.83

Hubert, H. and Barberon, J., **Étude préliminaire des parasites atmosphériques au moyen de l'oscillographe cathodique.** [Preliminary study of sferics by means of the cathode-ray oscillograph.] *Académie des Sciences, Paris, Comptes Rendus,* 207:400–402, **1938. DLC**—Measurements made in Martinique with a special radio receiver and a cathode-ray oscillograph are described. Two different types of records were obtained, one connected with "crackings" the other with "discharges" thus confirming earlier findings regarding differences between the physical properties of these two types of sferics. *Subject Headings:* **1. Sferics wave forms 2. Cathode-ray oscillographs 3. Sferics wave form recorders 4. Martinique, F. W. I.**

**4K–147** 551.508.94:551.501.83

Lugeon, Jean and Nobile, Guido, **Le radiomaxigraphe—enregistreur d'intensité des parasites atmosphériques.** [The radiomaxigraph—recorder of atmospheric parasite intensity.] *Switzerland. Meteorologische Zentralanstalt, Annalen,* 75(9), **1938.** 13 p. 10 figs., 8 refs. **DLC**—The equipment and circuits of this device are described and illustrated in great detail, including simple records. The idea is that the record will be a trace, not of each individual impulse but of the high points of each successive oscillation. The use in locating sources of sferics of various types or from various air masses is elaborated. *Subject Headings:* **1. Radiomaxigraph 2. Sferics recorders 3. Zurich, Switzerland.**—*M.R.*

**4K–148** 551.501.83:551.515.4 551.515.8

*†Lutkin, F. E., **Directional recording of radio atmospherics.** *Institution of Electrical Engineers, Journal,* 82(495):289–302, March **1938.** 10 figs., 21 refs. **DLC**—Three years' (1930/33) recordings of sferics with an improved frame aerial recorder were analyzed. Sferics as received in England arrive from W or SW, generally, but in summer afternoons the E and SE directions in conjunction with local storms were dominant. The records, shown in curves, indicated increased activity when the fronts associated with depressions moved over the Atlantic rather than over land. Sferics, no doubt, are associated with intense depressions and so far as long wave reception in England is concerned, are generated in distant thunderstorms. *Subject Headings:* **1. Sferics sources 2. Sferics from fronts 3. Sferics from thunderstorms.**—*W.N.*

**4K–149** 551.594.7:06

Paoloni, Bernardo M., **Come funziona il Servizio Radioatmosferico Italiano. Istruzioni pratiche ad uso delle Stazioni R. T. del R. Esercito che na fanno parte.** [How the Italian Radioatmospheric Service operates. Practical instructions for the use of. . . .] *Meteorologia Pratica,* 19:198–219, **1938.** figs., tables, refs. **DWB**—The Service established in 1928, the observations at each station, the scale (Paoloni) used for recording sferics and instructions for observations of intensity and frequency of sferics are treated. Sample form for recording 5 times a day are presented and instructions for observing and recording transmission conditions and fading of radio signals and for correlating sferics observations with atmospheric pressure, etc. given. *Subject Headings:* **1. Sferics networks 2. Sferics observation techniques 3. Instruction for observers 4. Italy.**—*M.R.*

**4K–150** 551.501.9:551.594.7

Paoloni, Bernardo M., **Dopo venticinque anni di osservazioni radioatmosferiche, 14 maggio 1913–14 maggio 1938.** [Twenty-five years of radioatmospheric observations, May 14, 1913–May 14, 1938.] *Meteorologia Pratica,* 19:53–72, **1938. DWB**—The article written by Paoloni in 1913 giving reasons for establishing a radio station at Montecassino to collect weather reports from other centers in Europe, and to study conditions of reception connected with weather, thunderstorms, etc. and the resulting establishment of such a station are mentioned. His 14 point scale for sferics and subsequent work up to 1938, including the organization of a radioatmospheric network and warning service in Italy, and scientific discoveries at Montecassino are also described. *Subject Headings:* **1. Sferics research 2. Sferics networks 3. Sferics scales 4. Montecassino Observatory, Italy.**—*M.R.*

**4K–151** 551.501.9:551.594.7

Ilardi, Piero, **Le ricerche sugli atmosferici in Italia.** [Sferics research in Italy.] *Meteorologia Pratica,* 19:195–197, **1938.** 4 refs. **DWB**—The research is described, beginning with Paoloni's work in 1913 and the inauguration of the Italian Radioatmospheric Service in 1928, with 24 stations in Italy, Sicily and Sardenia recording data on sferics (Paoloni scale) and the intensity and frequency

of sferics on 420 and 2650 m as well as data on fading, etc. *Subject Headings:* **1. Sferics networks 2. Sferics research 3. Italy.**—*M.R.*

**4K–152** 551.501.83:551.594.22

*Schonland, B. F. J. and Hodges, D. B., **Progressive lightning V. A comparison of photographic and electrical studies of the discharge process.** *Royal Society of London, Proceedings, Ser. A*, 166(924):56–75, May 4, **1938.** 16 figs., tables, 10 refs., 4 eqs. **DLC**—Several hundred lightning discharges from within the thunderclouds were recorded (oscillograph) and compared with Boys camera pictures. It was found that the usual field change is a simple slow rise to a final maximum. These air discharges, from cloud to a space charge in the air, were supposed to be of the same nature as the flashes between different parts of the clouds. It is suggested that cloud discharges are not as effective as sources of distant sferics as are ground discharges. *Subject Headings:* **1. Sferics from lightning 2. Lightning discharges 3. Sferic sources 4. Lightning photographs 5. Boys camera.**—*W.N.*

**1939**

**4K–153** 551.501.83

Bureau, Robert and Douguet, M., **Parasites atmosphériques dans les régions australes.** [Atmospherics in the Southern Hemisphere.] *Académie des Sciences, Paris, Comptes Rendus*, 209:117–119, **1939. DLC**—During a trip of the French vessel Bougainville (1938–39) in the S. Indian Ocean sources of sferics were located. An analysis of the records shows that all sources are over the African continent and none could be detected over the ocean. The diurnal frequency variation is similar to that found over the Northern Hemisphere. *Subject Headings:* **1. Sferics source distribution 2. Africa 3. Southern Hemisphere.**—*G.T.*

**4K–154** 551.501.83

Chakravarti, S. P., **Sur le champ des parasites atmosphériques à Calcutta.** [Field intensity of sferics at Calcutta.] *L'Onde Électrique*, 18(207):99–110, March **1939.** 6 figs., 3 tables. **DLC**—After a description of measurement techniques, data are presented on the field intensity of sferics on different wave lengths at various times of the year (Jan.–Aug. 1938). Meteorological conditions are indicated. Intensities in India are compared with those in Europe. *Subject Headings:* **1. Sferics intensities 2. Sferics measurement 3. India 4. Europe.**—*G.T.*

**4K–155** 551.508.94:551.501.83

Chakravarti, S. P., **Sur la forme des parasites atmosphériques à Calcutta.** [The sferics wave forms at Calcutta.] *L'Onde Électrique*, 18(208):181–186, April **1939.** 4 figs. **DLC**—Apparatus used in determining wave forms of atmospherics is described. Different wave forms found at Calcutta (Feb.–Aug. 1938) are shown in diagrams. Three principal types are identified; their connection with various weather situations is briefly discussed. *Subject Headings:* **1. Sferics wave forms 2. Sferics wave form recorders 3. Calcutta, India.**—*G.T.*

**4K–156** 551.501.83:551.515.4

Chapman, F. W., **Atmospheric disturbances due to thundercloud discharges I.** *Physical Society of London, Proceedings*, 51:876–894, **1939.** 10 figs., 16 refs., 3 eqs. **DLC**—Various ways of delineating photographically the random transient changes in the earth's electric field by means of a cathode ray oscillograph are described together with a convenient method of recording the time history of all the disturbances that arise from a thundercloud discharge. Results obtained from interpretations of records give the magnitude and nature of the currents involved in the various stages of the flash. (*Same item* as H–82, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm electricity 2. Sferics from thunderclouds.**—*From author's abstract.*

**4K–157** 551.501.8

Leushin, N. I., **Sovremennoe sostoianie voprosa ob atmosfernykh pomekhakh.** [The present state of the problem of atmospherics.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geofiz.* No. 6:707–717, **1939.** 10 figs., 13 refs. **DLC**—Review of foreign literature, discussing typical forms of sferics of short and long duration, as well as measurements of direction and intensity and the use of gnomonic projection maps for the location of distant thunderstorm regions, using long radio waves. The author shows also his records of sferics made at Slutsk on the radio wave 200 m with an action radius of 300 km. The relation with thunderstorm regions in the Leningrad district is illustrated by synoptic maps. *Subject Headings:* **1. Sferics research 2. Sferics thunderstorm detection 3. Slutsk, U.S.S.R. 4. Leningrad, U.S.S.R.**—*A.A.*

**4K–158** 551.508.94 551.501.83:551.50

Lugeon, Jean, **Le radiographe de la Station centrale suisse de Météorologie et son utilisation pour la prévision du temps.** [The radiograph of the Swiss Central Meteorological Station and i

plication to weather forecasting.] *Switzerland. Meteorologische Zentralanstalt, Annalen*, 76(10), 939. 24 p. 32 figs., 7 refs. **DLC**—This is an important and comprehensive article giving advances ade in Switzerland up to that date. The rotating antenna installed on the roof of the Physics uilding at Zurich, the amplifiers, recorders and sample records are illustrated. The use of the diograph in forecasting or locating sources of sferics nearby or at great distances is described. ules for forecasting from the sferics records as applicable to Switzerland are listed. *Subject Headgs:* **1. Radiogoniographs 2. Sferics recorders 3. Thunderstorm forecasting from sferics Sferics research 5. Zurich, Switzerland.**—*M.R.*

**4K–159** 551.501.83:551.515.4

*Lutkin, F. E., **Nature of atmospherics. Pt. VI.** *Royal Society of London, Proceedings*, 171(946): 5–313, Jan. 6, **1939.** 20 figs., 6 tables, 14 refs. **DLC**—One series of observations was made in the utumn of 1934 for the purpose of testing methods for improved resolutions of wave forms. The bservations—at considerable distance from receiver—were recorded on 35 mm film. The next ries, summer of 1936, was of observations from thunderstorms close to one receiver and the recordgs were made on a special emulsion paper. It was found that 80% of the lightning flashes destroyed e negative cloud moments which accounts for almost all flashes in a heat storm. The positive oments in a frontal storm were destroyed as frequently as the negative ones during successive scharges (4–5) in time (1/10 to 1/100 sec). *Subject Headings:* **1. Sferics wave forms 2. Sferics om thunderstorms.**—*W.N.*

**4K–160** 551.501.83:551.515.2

Sashoff, S. P. and Weil, J., **Static emanating from six tropical storms and its use in locating osition of the disturbances.** *Institute of Radio Engineers, N. Y., Proceedings*, 27(11):696–700, ov. **1939.** 11 figs. **DLC**—Equipment and methods used by the universities of Florida and uerto Rico in obtaining and analyzing static connected with tropical storms are described. The aths of six storms as obtained by triangulating synchronized records of sferics are plotted on charts. is suggested that discrepancies between these paths and those reported by the U. S. Weather ureau may be due to the fact—partly verified by Florida observers—that static emanates from the eripheries of a storm rather than its center. (For later report on same project *see* 4K–170 below.) *ubject Headings:* **1. Sferics equipment 2. Sferics storm detection 3. Sferics recording methods.**— *T.*

**4K–161** 551.501.83

Schindelhauer, F., **Peilung der Ausgleichsvorgänge, die Luftstörungen verursachen.** [Bearings discharge phenomena giving rise to sferics.] *Hochfrequenztechnik und Elektroakustik*, Berlin, 4(4):109–111, Oct. **1939. DLC**—Observations of sferics at Potsdam Observatory in July to Oct. 938 are discussed. The results, presented in curves, show long wave sferics of E–W direction in e morning, turning more to N–S at midday. The short wave sferics generally came from N–S, herwise following the diurnal variation as for long wave sferics. Sferics originate in the ionosphere, e ionospheric currents give rise to the E–W direction. Sferics may also be produced by thunderorms. *Subject Headings:* **1. Sferics sources 2. Sferics from ionosphere 3. Sferics from thunderorms 4. Germany.**—*W.N*

**4K–162** 551.501.83:551.510.535

Schonland, B. F. J.; Elder, J. S. and van Wyk, J. W., **Reflection of atmospherics from the nosphere.** *Nature*, London, 143(3630):893–894, May 27, **1939.** fig., 4 refs. **DLC**—The analysis thousands of sferics oscillograms that travelled from 50 to 2800 km supports the Australian findings at the structure of the wave form arises from repeated reflections. Evidence for the existence of a al lowering of the effective height of reflection was found. The sferics discussed were all due to ashes to ground. *Subject Headings:* **1. Sferics reflections from ionosphere 2. Lightning.**—*W.N.*

**4K–163** 551.501.83

Webster, H. C., Munro, G. H. and Higgs, A. J., **Further studies of directions of atmospherics Toowoomba and Canberra.** *Australia. Council for Scientific and Industrial Research, Bulletin*, o. 127:7–21, **1939.** 9 figs., 2 tables, 5 refs. *Australia. Radio Research Board, Report* No. 14. **WB**—As a further analysis of the results obtained from measurements (summer 1933–1934) escribed in an earlier paper (see 4K–126), the authors present charts containing statistical material n various types of sources, their distribution, effective area, duration and activities. The area overed by the study is the eastern half of Australia and the surrounding ocean. *Subject Headings:* **Sferics sources 2. Australia.**—*G.T.*

## 1940

**4K–164** 551.594.6:551.510.535

Laby, T. H., McNeill, J. J., Nicholls, F. G. and Nickson, A. F. B., **Wave form, energy and flexion by the ionosphere of atmospherics.** *Royal Society of London, Proceedings, Ser. A*, 174(957):

145–163, Feb. 1, 1940. **DLC**—Work was begun in the study of the wave form of sferics by physicists of the Radio Research Board of Australia in 1935. Evidence that atmospherics are reflected by the ionosphere was obtained in 1937. This article summarizes systematically the work done and reported in earlier papers, including a description and illustration of equipment, ray theory of reflection at the ionosphere, calculation of oscillograms, relation between field strength and distance of source, energy and speed. Atmospherics were recorded from sources 70 to 1500 km distant and paths both direct and reflected from ionosphere were calculated. From the time interval (distance on photographic record) between direct and reflected impulse, the height of reflecting layer and distance of source can be calculated. Heights lie between 53 and 82 km. Relation between distance and field strength is linear. *Subject Headings:* **1. Sferics reflections from ionosphere 2. Sferic wave forms 3. Sferics energy 4. Reflecting layer height determination.**—*M.R.*

**4K–165** 551.501.8

Paoloni, Bernardo M., **Sul sistema adottato dal Servizio Radioatmosferico Italiano nelle su osservazioni.** [The observation method adopted by the Italian Radioatmospheric Service.] *Meteorologia Pratica*, 21:17–27, 1940. fig., table, ref. **DWB**—Reply to indirect criticism by I. Ranzi of the atmospherics measurement method initiated by the author. Among several statements made by Ranzi the author refutes his assertion that "it appears from the numerous investigations carried out so far that atmospherics are invariably connected with meteorological disturbances having thunderstorm character." The author names several authorities whose investigations establish the connection of sferics with sources other than thunderstorms (rain, solar activity, vertical temperature gradient, frontal activity, cosmic radiation, atmospheric electric field intensity). *Subject Headings:* **1. Sferics measurement 2. Sferics sources.**—*G.T.*

**4K–166** 551.501.83:551.515.

Schonland, B. F. J.; Hodges, D. B. and others, **Direction-finding of sources of atmospherics and South African meteorology.** *Royal Meteorological Society, Quarterly Journal*, 66(283):23–4 Jan. 1940. 9 figs., 17 refs. **DWB**—A detailed summary of results of 15 months (in 1937 and 38) of sferics location with cathode ray direction finders operating continuously at Johannesburg Durban and Bulawayo in South Africa. The accuracy with which sources of atmospherics may be located, their correlation with weather (CuNb or lightning, fronts, hurricanes, etc.) and possible value in forecasting are considered. Base lines between stations were 490, 720 and 1020 km, respectively. Stations operated in 30 km wave length, with range of 1500 to 3000 mi and accuracy of <50 km up to 900 km in >95% of the cases, or an azimuth accuracy of ±1.5°. Of 275 cases examined, 76% occurred in connection with reported thunder or CuNb clouds, 18% with nimbus and 5% uncertain. Only 1.5% were definitely erroneous or not associated with weather. Maps show adequacy of method with the 3 stations used in network. On the 8 days illustrated, almost every thunderstorm area within a radius of 1000 mi was located. If triangulation communication were available 3 times a day instead of once, equally accurate charts could be obtained 75% of all the days in the year. No sferics were reported on days with known dust storms in the arid region. On 89% of the days when sferics were reported, the sources could be found within 700 mi and in the majority of cases <150 miles of the center of a LOW. Sources were found within 500 mi of the center of HIGH on only 3 days (4% of cases with HIGH's). Diurnal and monthly variation reveal new information on thunderstorm regime in South Africa and the adjacent Indian Ocean area. Seasonal variation is shown in comparison with that according to C. E. P. Brooks and difference where they exist, analyzed. Charts show scatter of sources in the entire area as located by the method. *Subject Headings:* **1. Sferics networks 2. Sferics goniometry accuracy 3. Thunderstorm frequencies 4. South Africa.**—*M.R.*

**4K–167** 551.501.8

*Schonland, B. F. J.; Elder, J. S.; Hodges, D. B. and others, **Wave form of atmospherics at night** *Royal Society of London, Proceedings, Ser. A.*, 176(965):180–202, Oct. 9, **1940.** 15 figs., 6 tables 14 refs., 7 eqs. **DLC**—The characteristics of night sferics within 2000 km are established. The height of the reflecting layer can be determined within +1 km. Pulse series analysis and cathode ray measurements of distance of sources agreed. The ground pulse velocity was within 0.7% that of light, when testable. *Subject Headings:* **1. Sferics wave forms 2. Reflecting layer height determination.**—*W.N.*

## 1941

**4K–168** 551.501.83:551.594.2

Lutkin, F. E., **Lightning and atmospherics.** *Royal Meteorological Society, Quarterly Journal* 67(292):345–349, 1941. **DWB**—Various types of lightning discharge produce varying wave forms on photographic recorders connected to direction finding equipment used for sferics detection. Each stroke is shown to consist of several separate discharges of very brief duration, part oscillatory and part slower and steadier. From these characteristic wave forms the same stroke can be identified

records made at 2 or more stations which can be used as a base line for triangulation. The cathode y direction finder is one type of equipment used in England, Australia and America. A two tenna type has also been used in South Africa (narrow sector frame recorder). Although sferics cur with as high a frequency as 100 per sec. (in winter to the W of the British Isles), it is still lieved that they come chiefly from thunderstorm discharges since it is possible for them to be corded from as far as 5000 mi. *Subject Headings:* **1. Sferics recorders 2. Sferics wave forms Sferics from lightning 4. Lightning frequencies.**—*M.R.*

**4K–169** 551.501.83:551.590.21

†*Rao, N. S. Subba, **The effect of sunset on atmospherics.** *Indian Academy of Sciences, Banlore, Proceedings, Sec. A*, 14:196–220, **1941.** 6 figs., 5 tables, 26 refs. **DLC**—Recordings of rics at 37.5 and 375 m. were made simultaneously by means of a novel device described. The udy shows that the effect of sunset on sferics is due to the trigger action as advanced by NAPIER AW (1933). Short wave and medium wave as influenced by sferics are presented graphically and cussed in relation to meteorological conditions in general and to the observational 14 days period Aug. 1940 in particular (active monsoon conditions). Correlation between prolonged sferics d formation of lows is studied. *Subject Headings:* **1. Sferics recorders 2. Sferics data 3. Twiht effects on sferics.**—*W.N.*

**4K–170** 551.501.83:551.515.4

Whipple, F. J. W., **Thunderstorm problems.** *Nature*, London, 148(3750):305–307, Sept. 13, **41. DLC**—Review of a discussion on "Thunderstorm Problems" held at the Royal Met. Soc., uth Kensington, Engl. One of the four contributions was a lecture by F. E. LUTKIN on methods recording and analyzing sferics. The contents of the lecture (photographic recording of wave ms; types of sferics; measurements in South Africa, Australia and England) are summed up efly. *Subject Headings:* **1. Sferics recording methods 2. Sferics from thunderstorms. I. Lutn, F. E.**—*G.T.*

## 1942

**4K–171** 551.594.21 551.501.83

†*Israël, Hans, **Die elektrischen Erscheinungen des Gewitters. Versuch einer kritischen Entneidung zwischen den einzelnen Gewittertheorien.** [Electrical phenomena of thunderstorms. attempt at a critical evaluation of various thunderstorm theories.] *Germany. Reichsamt für etterdienst, Wissenschaftliche Abhandlungen*, 8(4), **1942.** 44 p. 56 figs., table, numerous refs., s. **DLC**—Although this monograph contains little which applies directly to sferics, it is one of the ost comprehensive monographs on the origin, structure and electric fields of thunderstorms and htning discharges ever published, and is necessary for any theoretical study of the origin, oscilory nature, fields, intensity and propagation of sferics. (*Same item as* H–113, Aug. 1950, *MAB.*) *bject Headings:* **1. Thunderstorm electricity 2. Lightning discharges 3. Sferics theory.**—*M.R.*

**4K–172** 551.501.83:551.515.2

Sashoff, S. P. and Roberts, W. K., **Directional characteristics of tropical storm static.** *Institute Radio Engineers, N. Y., Proceedings*, 30(3):131–133, March **1942.** 3 figs. **DLC**—Further tails on research reported earlier by S. P. SASHOFF and J. WEIL (*see* 4K–160 above). General ectional distribution of sferics in relation to prevailing active storm areas is discussed. In conction with a tropical storm which crossed Florida in Aug. 1939 it was found that: a) apparently no tic emanates from the eye of a storm and b) the relative position of static-producing areas remains ed with respect to the storm center. *Subject Headings:* **1. Sferics directional distribution Sferics from storm centers.**—*G.T.*

**4K–173** 551.594.21

Workman, E. J.; Holzer, R. E. and Pelsor, G. T., **The electrical structure of thunderstorms.** *S. NACA, Technical Note*, No. 864, Nov. **1942.** 47 p. 15 figs., 6 tables, 7 refs., eqs. **DLC**—e time histories of thunderstorm charge distribution during three storms occurring during the mmer of 1940 in the vicinity of Albuquerque airport were investigated by the use of eight synronized recording electrometers arranged in a particular pattern over a field 1.6 km above sea el. Horizontal and vertical cross sectional and vertical cross sectional diagrams are presented to ow the instantaneous mid-interval positions, the signs and the magnitudes of all charges involved strokes during specified uniform time intervals. *Subject Headings:* **1. Thunderstorm electricity Sferics from thunderstorms.**—*From authors' abstract.*

## 1943

**4K–174** 551.501.83:551.515.8

Berson, F. A. and Petterssen, Sverre, **Atmospherics in relation to fronts and air masses, winter 42–43.** Pencilled in: *U. S. Office of Naval Operations, NAVAER* 50:IT–38, June **1943.** 12 p.

charts. Summary in Portuguese by A. N. da Silva entitled: **Parasitas atmosféricos.** *Portugal Serviço Meteorológico Nacional, Memoria*, 1(1), **1949.** 10 p. **DWB**—Observations of sferics mad between Dec. 1, 1942 and March 10, 1943 are analyzed statistically. The three stations are Dun stable, Leuchars and St. Eval in the British Isles, with base lines of 425, 370 and 220 mi. Th accuracy of observations, geographical distribution and relation of sferics to cyclone waves, occlusions cold fronts, mP, cP and mT air masses and the frequency and periodicity of frontal atmospherics ar considered. Data are shown on charts of N. Atlantic or on polar charts on a grid of 2° squares (*Same item as* 3.9–233, Sept. 1952, *MAB.*) *Subject Headings:* **1. Sferics sources 2. Sferics fron fronts 3. Frontal thunderstorms 4. North Atlantic. I. Great Britain. Meteorological Researc Committee II. da Silva, A. N.**—*M.R.*

**4K–175** 551.501.83:551.515.

Forrest, J. S., **The determination of the location and frequency of thunderstorms by a radi method.** *Royal Meteorological Society, Quarterly Journal*, 69:33–46, Jan. **1943.** 9 figs., 2 table 9 refs. **DLC**—A method of continuously recording atmospherics in order to obtain warning of th outbreak of a thunderstorm and to determine the distance of the storm from the recording site i described. Results of three years' experience with this technique are given. The relation betwee the recorder output and the storm distance had been determined by correlating the output record deflections with the known locations of electric power system breakdowns due to lightning. Sta tistical data on the frequency of thunderstorms and details of diurnal variations in the intensity atmospherics in the south of England are given. (*Same item* as H–122, Aug. 1950, and 2H -1. Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics thunderstorm detection 2. Thunderstorm fore casting from sferics 3. Diurnal sferics variations 4. Southern England.**—*From author's abstract.*

**4K–176** 551.501.83:551.515

Forrest, J. S., **Tracing thunderstorms; a use for atmospherics.** *Wireless World*, 49(7):192–19 July **1943.** 3 figs. **DLC**—A summary of direction finding methods for locating thunderstorm by means of atmospherics. A rectifier type, moving-coil pen-recorder is used and described. (*San item as* 2H–14, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics thunderstorm detection 2. Sferi recorders.**—*W.N.*

**4K–177** 551.501.83:551.515.4 551.508.9

Lugeon, Jean, **Über Gewitterregistrierung.** [Recording of thunderstorms.] *Schweizerisch Elektrotechnischer Verein, Zürich, Bulletin*, 34(2):29–43, Jan. 27, **1943.** 23 figs., 7 refs. Als Nobile, Guido, **Peilgerät für atmosphärische Störungen.** *Ibid.*, p. 43–46. **DWB, DLC**—A historic sketch outlines the progress in recording sferics or parasites by radiogonometric methods duri the past quarter of a century. The author built an atmoradiograph in 1926 to register the numb of parasites per minute and, in 1939 with G. Nobile, the radiomaximograph giving the intensi and approximate distance of origin. Other instruments were constructed by the author and Watson-Watt and Bureau between 1928–34. These instruments and their records are describ and illustrated in detail. Thunderstorms were classified for the Alps (1925) and the several typ are described and their forecasting in Switzerland discussed. Synoptic conditions for these sto types and the accuracy of determination of lines of thunderstorms by radiogoniometry are beau fully illustrated with many kinds of charts. Application to warnings for power line transmissi systems in Switzerland pointed out and a network of 3 goniometer stations suggested as am for warnings seven hours in advance in that country. In the second paper the author describ and illustrates a new radiogoniometer built for the Swiss Central Meteorological Station at Züric It records with an accuracy of 1° the direction of sferics as far away as the East Coast of the U.S. and even if there are nearby violent thunderstorms. *Subject Headings:* **1. Sferics equipme 2. Sferics thunderstorm detection 3. Progress in sferics recording. I. Nobile, Guido.**—*M.R.*

**4K–178** 551.501.83:551.513.2:551.553.

Rao, N. S. S., **Atmospherics during the monsoon period.** *Indian Academy of Sciences, P ceedings, Sec. A*, 17:83–105, March **1943.** **DLC**—Directional receivers are valuable in givi information on depression developments which are accompanied by sferics activity in the ea morning hours or throughout the night during unsettled conditions. Sferics as accompanyi depressions and withdrawal of the monsoon are discussed. The latter accompanied by heat thund storms gives rise to sferics in the evening hours. *Subject Headings:* **1. Sferics from thunderstor 2. Sferics during monsoon 3. India.**—*W.N.*

**4K–179** 551.501.83:551.513.2:551.553.

Rao, N. S. S., **A further study of atmospherics during the monsoon period.** *Indian Acade of Sciences, Proceedings, Sec. A*, 18(3):127–139, Sept. **1943.** 4 maps, 12 refs. **DLC**—Sferics activ during the transition period from SE (summer) monsoon to NE (winter) monsoon and during t

atter itself was studied in relation to weather maps. The large peaks observed in the evening and arly night hours were governed by the developing pressure region in the centre of the Peninsula. The distinctly marked difference in variation between the summer and winter monsoons may be scribed to: 1) lower temperature, 2) less available height for storm development, 3) an upper air urrent, direction of which differs from that in the lower troposphere and 4) larger leaking effects hat prevent triggering of the cloud charges. *Subject Headings:* **1. Sferics during monsoon 2. Sferics ariations 3. India.**—*W.N.*

**4K–180** 551.501.83:551.515.4

*†Schonland, Basil F. J., **Thunderstorms and their electrical effects.** *Physical Society of London, roceedings*, 55, Pt. 6 (312):445–458, Nov. 1, **1943.** 12 figs., 22 refs. **DLC**—Several hundred pictures aken with the Boys camera and simultaneous recording with a cathode-ray oscillograph at Johannesurg during 1932–1936 were analyzed. Discharges from isolated storms of the thermal convection ype have fewer strokes (frequently one) than those from frontal storms (up to 40 strokes). Separate trokes, with few exceptions, start from the negative part of the cloud and convey negative electricity o the earth. Sferics from discharges to ground can be distinguished from those within clouds by he characteristics of wave forms. Leader pulses have been recorded up to 3000 km from parent ash. Diagrams of multiple strokes are presented. *Subject Headings:* **1. Thunderstorm electricity . Sferics wave forms 3. Johannesburg, South Africa.**—*W.N.*

## 1944

**4K–181** 551.501.83:551.515.4 551.594.21

Israël, Hans, **Sprunghafte Änderung des luftelektrischen Feldes und Gewitter.** [Sudden hanges in atmospheric-electric field and thunderstorms.] *Meteorologische Zeitschrift*, 61:1–8, **1944.** 5 figs., 2 tables, 10 refs., 4 eqs. **MH-BH**—Plan of field of variograph used, some sample recordings uring thunderstorms, a statistical table of thunderstorm observations and sudden changes of lectric field for the period 1939–1941. Application of results to short range forecasting. (*Same em as* H–140, Aug. 1950, *MAB.*) *Subject Headings:* **1. Thunderstorm electricity 2. Sferics from hunderstorms 3. Thunderstorm forecasting from sferics.**—*H.P.K.*

**4K–182** 551.501.83:551.508.94

Kimpara, Atsushi (*Nagoya University*), **The wave form of atmospherics in day time.** p. 14–16 source unknown] [after **1944**]. 6 figs. **DWB**—Report on measurement of the wave forms of aytime sferics conducted from 1940 to 1944 with cathode-ray oscillographs placed at Iwatsuki eceiving Station, Kanto District, Japan and 56 km from there at Kakioka Magnetic Observatory. ighty five hundred observations were recorded. A few details on the equipment used are given. requency curves of atmospherics due to lightning discharges between clouds and earth, to disharges between and within clouds and to reflexion from the E-layer are presented and briefly ommented on. Wave forms suggest that daylight atmospherics in summer all originate in some ind of electric discharge in the atmosphere. *Subject Headings:* **1. Sferics wave forms 2. Cathode-ay oscillographs 3. Sferics measurement.**—*G.T.*

**4K–183** 551.501.83:551.509.34:551.594.7

Schindelhauer, F. and Israël, Hans, **Die Peilung von Luftstörungen der drahtlose Telegraphie um Zwecke der Wettererkundung. (Arbeitsmethoden und bisherige Betriebserfahrungen.)** [Location of atmospheric disturbances in radio transmission (sferics) for the purpose of weather forecasting. (Working methods and previous experiences.)] *Germany. Reichsamt für Wetterdienst. Forschungs- und Erfahrungsberichte, Ser. A*, No. 18, **1944.** 40 p. 45 figs., refs. **DWB**—A comprehensive study of the methods for determining location of source of sferics and the frequency of hunderstorms over various regions within 1000 mi of France and Germany. The usefulness in eporting and forecasting fronts and storm areas is brought out by numerous examples of frontal harts made up just from radio-location data. (*Same item as* 2H–18, Aug. 1951, *MAB.*) *Subject leadings:* **1. Radiogoniometry 2. Weather forecasting from sferics 3. Sferics thunderstorm etection 4. Thunderstorm frequencies 5. France 6. Germany.**—*M.R.*

## 1945

**4K–184** 551.501.83:551.515.8

*Berson, F. A. and Petterssen, Sverre, **Atmospherics in relation to fronts and air masses. (Winter 942–43.)** *U. S. Office of Naval Operations, NAVAER* 50-IT-38, May **1945.** 12 p. 8 figs. From publication of [Great Britain] Meteorological Research Committee, June **1943.** **DWB**—Sferics s observed during the winter months 1942–43 are statistically analyzed and discussed in relation o fronts and air masses within a 10,000 sq. mile section including Iceland, Scandinavia, Finland, ngland and the continent. It was found that there is a marked 5-day period within a region

45° to 55° N and 20° to 35° W which was not found within the region 35° to 45° N and 5° to 20° W. It is indicated that 10–12 day period exists within both of these regions. The periods of observation were too short for determining the longer periods. *Subject Headings:* **1. Sferics from fronts 2. Sferics data.**—*W.N.*

**4K–185** 551.501.83:551.515.4 551.501.81

Bureau, Robert, **La localisation radioélectrique des orages.** [Radio-electric location of thunderstorms.] *La Météorologie*, 3rd Ser., Nos. 58/60:149–162, July/Dec. **1945.** 4 figs., refs. **DWB**—The use of special goniometers for location of thunderstorms is discussed. Registering of atmospherics is used to determine near and distant storms. Examples of method given. (*Same item as* H–149, Aug. 1950 and 2H–23, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics thunderstorm detection 2. Radiogoniometers.**—*H.P.K.*

## 1946

**4K–186** 551.501.83

Douglas, C. K. M., **A preliminary note on summer atmospherics.** *Great Britain. Meteorological Research Committee, Meteorological Research Paper*, No. 297, **1946.** 6 p. **DWB**—Sferics recorded in Great Britain during the summer half years 1943–1945 are discussed as to their geographic distribution over land and sea, their annual and diurnal variations and their connection with large scale pressure developments, high surface temperature, horizontal temperature gradients, deep cold air, warm and cold fronts, occlusions and rainfall. *Subject Headings:* **1. Sferics distribution 2. Sferics variations 3. British Isles.**—*G.T.*

**4K–187** 551.501.83:551.515.4

Foldes, G., **Radiolocalisation des orages. Exemple de la journée du 8 juin 1946.** [Radiolocation of thunderstorms. June 8 (daytime) 1946 as an example.] *France. Laboratoire National Radioélectrique, Notes Preliminaires*, No. 99, **1946.** Also: Doury, P., **Radiolocalisation des orages Exemple de la nuit du 3 au 4 juillet 1946.** [. . . The night of July 3–4, 1946 as an example.] *Ibid.* No. 100, **1946. DBS**—*Subject Heading:* **1. Sferics thunderstorm location.**

**4K–188** 551.501.83

Haubert, A., **Propagation normale et propagation guidée d'un atmosphérique dans l'atmosphère** [Normal and guided propagation of sferics in the atmosphere.] *Annales des Télécommunications* Paris, 1:185–208, Aug./Sept. **1946. DLC**—Various types of sferics are discussed, characteristics analyzed and recordings demonstrated. The 50 km reflecting region above the earth is responsible for the different sferics recorded, as a function of the critical frequency. *Subject Heading:* **1. Sferics reflections from ionosphere.**—*W.N.*

**4K–189** 551.508.85:551.515.4

Reber, C. M., **Applications of electronics to meteorology.** *American Meteorological Society Bulletin*, 27(7):365–372, Sept. **1946.** 7 figs. **DWB, MH-BH**—A simple, illustrated account of the use of radar in detecting and tracking thunderstorms, showers, hurricanes, upper winds, rawinsondes and a brief reference to sferics. (*Same item as* 2H–50, Aug. 1951, *MAB.*) *Subject Headings* **1. Radar storm detection 2. Sferics on radar 3. Radar observations.**—*W.N.*

**4K–190** 551.501.83:551.508.8

Spilhaus, Athelstan F., **Recent developments in meteorological equipment.** *American Meteorological Society, Bulletin*, 27(7):399–409, Sept. **1946.** 5 figs., 17 refs. **MH-BH**—A paper devoted to the wartime demand for meteorological techniques and instruments. Radar, as used in storm and sferic detection, other instruments and their development until the present are described. (*Same item as* 2H–52, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Sferics on radar.**—*W.N.*

## 1947

**4K–191** 551.501.83:551.508.94

Adcock, F. and Clarke, C., **The location of thunderstorms by radio direction-finding.** *Institution of Electrical Engineers, Journal*, 94, Pt. III (28):118–125, March **1947.** 7 figs., 3 tables, 6 refs. **DBS**—The nature of radiation from a lightning flash is discussed. Description of a direction finder of great accuracy is given. Causes of instrumental inaccuracies and methods of improvement are discussed. (*Same item as* 2H–60, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics thunderstorm location 2. Radiogoniometry 3. Lightning radiation.**—*W.N.*

**4K–192** 551.501.83:551.515.4 551.501.83:551.590.2

Khastgir, S. R.; Das Gupta, M. K. and Ganguli, D. K., **Location of thunderstorm from directional observations of atmospherics during sunrise and sunset.** *Nature*, London, 159(4043):572

573, April 26, 1947. fig., table, 8 refs. Also: **Some directional observations of atmospherics on 1000 meters during sunset time.** *Indian Journal of Physics*, Calcutta, 21:169–180, Aug. 1947. **DLC**—1) A method to estimate difference between longitude of source and receiver is discussed. (*Same item as* 2H–75, Aug. 1951, *MAB.*) 2) A method is developed to locate the center of a thunderstorm that gives rise to sferics. Results of directional observations of sferics (sunrise and sunset), May–June 1946, are presented. *Subject Headings:* **1. Radar storm detection 2. Sferics thunderstorm location 3. Twilight effects on sferics.**—*W.N.*

**4K–193** 551.501.83:551.508.85

Levy, M., **Signal-noise ratio in radar.** *Wireless Engineer*, London, 24(291):349–352, Dec. 1947. 5 figs., 5 eqs. **DLC**—This study demonstrates the application of statistics to radio (radar) problems. The small pulses that are so hard to detect, especially when mixed with noise, will be improved greatly in visibility on the cathode ray tube by a method of cutting either the upper or lower part of the received signal by a limiter. The method is described in detail. (*Same item as* 2H–76, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics on radar 2. Radio equipment 3. Radar equipment.**—*W.N.*

**4K–194** 551.501.83:06

Lugeon, Jean, **International Commission for Synoptic Weather Information, Sub-commission of Sferics, Report for the Toronto Meeting.** *Canada. Meteorological Div., CIR/IMO/T-21*, July 18, 1947. 8 p. **DWB**—A concise but comprehensive summary of the history of sferics research, especially as concerning the action or resolutions of international organizations (I.U.G.G., U.R.S.I., IMO, I.C.S.U., etc.) dealing with sferics research or networks. The instrumental methods, organization of operators, results obtained as applicable to synoptic meteorology, aerology and radio or radar propagation, codes for transmission of sferics, data ("ATMOS" code) and suggestions for international cooperation are contained in the report. *Subject Headings:* **1. Sferics research 2. Sferics networks 3. Sferics codes 4. I.M.O. Resolutions. I. I.M.O. Commission for Synoptic Weather Information. Sub-Commission of Sferics.**—*M.R.*

**4K–195** 551.508.94:551.501.83:551.594.22

Schonland, B. J. F. and Gane, P. G., **A lightning warning device.** *South African Institute of Electrical Engineers, Johannesburg, Transactions*, 38:119–125, April 1947. fig. **DLC**—The field change due to lightning flashes transformed into current pulses and the discharge current produced by a vertical rod are detected by an electronic device that gives anticipatory audible and visible warning of imminent flashes in the near vicinity and indicates the presence of lightning within 20 mi. Circuit diagram is given. *Subject Headings:* **1. Sferics from lightning 2. Sferics recorders 3. Lightning detection 4. Thunderstorm warning.**—*A.A.*

## 1948

**4K–196** 551.501.8:551.509.21

Ångström, Anders, **Den senaste utvecklingen av väderlekstjälpmedel.** [Recent developments of technical facilities for weather service.] *Ymer*, Stockholm, 68(3):189–205, **1948.** 7 figs. In Swedish. **DLC**—An illustrated article describing in considerable detail the new facilities that have been developed since the war for filling in the gaps in the weather map: the network of Ocean Weather Ships in the Atlantic; the use of radar to detect hurricanes, showers and thunderstorms that might develop or "slip through" between stations or weather ships; the weather flights made by the U. S. over the Pacific, the Caribbean, the Atlantic and Arctic (from Fairbanks to the Pole) to supply synoptic and aerological reports where no surface stations exist; thunderstorm and frontal detection by radiogoniometry of sferics; the use of radar to determine upper air winds and, finally, the new methods of synoptic analysis used by the Swedish Weather Service (use of pressure surface contours instead of isobars for upper air analysis). (*Same item as* 10–11, Nov. 1950 and 2H–96, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radar equipment 2. Progress in meteorology 3. Sferics storm detection.**—*M.R.*

**4K–197** 551.594.7

Goldman, Stanford, **Some fundamental considerations concerning noise reduction and range in radar and communications.** *Institute of Radio Engineers, Proceedings*, 36(5):584–594, May **1948.** 6 figs., refs., 23 eqs. **DLC**—A general mathematical analysis, based upon the theory of probability, is applied in this investigation to microwave signals through a background of random noise. The problems of noise reduction are treated in some detail and author discusses some possible ways to improve upon the range of radar and communication systems. Author deals with the question of possible similarity and relation of his work to biology and psychology. (*Same item as* 2H–107, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radar echoes 2. Sferics on radar 3. Radar equipment.**—*W.N.*

**4K–198** 551.594.7:551.501.83

*Hales, A. L. (*The Bernard Price Inst. for Geophys. Res. Univ. of the Witwatersrand*), **A possible mode of propagation of the "slow" or tail component in atmospherics.** *Royal Society of London, Proceedings, Ser. A*, 193(1032):60–71, April 22, **1948.** 7 figs., table, 7 refs., 6 eqs. **DLC**—A solution that qualitatively corresponds with observed velocities and periods of the slow component of sferics is presented in this theoretical treatment, based on the assumption of surface wave propagation. *Subject Headings:* **1. Sferics propagation 2. Sferics theory.**—*W.N.*

**4K–199** 551.501.83:551.515

Kessler, William J. and Knowles, Harold L., **Direction finder for locating storms.** *Electronics*, Albany, N. Y., 21(5):106–110, May **1948.** 6 figs., 2 photos, 11 refs. **DLC**—An instantaneous static direction finder and some experimental results of a network are discussed. The device consists of two loop antennas right-angled to each other. The vertical and the horizontal signal voltage, after being separately amplified, give visible flash lines on a tube screen indicating direction of static. (*Same item as* 2H–108, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Radar equipment 3. Sferics on radar 4. Sferics direction finders.**—*W.N.*

**4K–200** 551.594.22(02)

†Maurain, Charles Honoré, **La foudre.** [Lightning.] Paris, Librairie Armand Colin, **1948.** 215 p. 7 figs., numerous tables, 82 refs., eqs. **DLC**—This book presents a systematic review of all of the aspects of thunderstorm electricity, based on literature published up to 1942. Many of the current theories (Simpson, Wilson, Ross Gunn and others) of lightning formation and of cloud physics, magnetic effects, luminosity, ball lightning, relation to solar activity, polarity of clouds, maintenance of earth's electric field (by lightning and rain), vertical currents, ionization, etc. are treated. Charges and discharges due to volcanic eruptions and sandstorms, atmospherics (sferics), acoustical effects, etc. are also considered. An ample bibliography and index of authors cited increase the value of the work as a reference book. (*Same item as* 9–154, Sept. 1950, *MAB.*) *Subject Headings:* **1. Lightning 2. Thunderstorm electricity 3. Sferics from lightning 4. Textbooks.**—*M.R.*

**4K–201** 551.501.83

Rivault, R., **Origine de certaines formes d'atmosphériques.** [Origin of certain forms of atmospherics.] *Académie des Sciences, Paris, Comptes Rendus*, 226:1300–1302, **1948.** **DWB**—Simultaneous observations with two cathode-ray direction finders 300 km apart were carried out. Different types of sferics are correlated with different storm phases. *Subject Headings:* **1. Sferics origin 2. Sferics wave forms.**—*W.N.*

**4K–202** 551.501.83

†Thomas, H. A., **The world distribution of radio noise.** *Institution of Electrical Engineers, Journal*, 95, Pt. 3(37):332–333, Sept. **1948.** 23 refs. **DLC**—Three years' data on simultaneous hourly (2.5 to 20.0 Mc/s) observations from 14 stations were analyzed. This shows that in nearly all cases 50% of the values lie within ±5 db and 90% within ±10db of the median value. The theory that noise (sferics) originates in tropical storm centers and reaches any particular location by long-distance propagation was verified only so far as short distance was concerned. No correlation between short-term increases in noise-level at different locations not far apart was found. *Subject Headings:* **1. Sferics distribution 2. Sferics sources 3. Sferics theory 4. Tropical cyclones**—*W.N.*

**4K–203** 551.594.

Smith-Rose, R. L., **Meteorology and the propagation of radio waves.** *Nature*, London, 161(4082):145–146, Jan. 24, **1948.** **DLC**—Review of work done during war, especially report prepared for general distribution after the war, on determination of the effect of various weather conditions on radio and radar propagation. (*Same item as* 1–176, Jan. 1950, *MAB.*) *Subject Headings:* **1. Sferics 2. Radio communication.**

**4K–204** 551.510.83:551.594.22:551.501.83

Wormell, T. W. and Pierce, E. T., **Atmospherics.** *Institution of Electrical Engineers, Journal*, 95, Pt. 3(37):331–332, Sept. **1948.** 4 refs. **DLC**—Properties of sferics, due to lightning discharges, were studied at Cambridge with cathode ray equipment of long constant (6 sec) photographic record. Other records, obtained by means of a capillary electrometer and amplifier, show only the electrostatic field (at about 200 km) even when the radiation field exceeds that in magnitude. Sferic wave forms from several hundred km were obtained by means of method described. One type of sferics consisted of series of irregular fluctuations at 10–20 kc/s, the other was a rather regular damped train of oscillations. The first type was usually associated with stepped leader lightning, the second

s ascribed to the rapid return stroke of earth bound flash. *Subject Headings:* **1. Sferics types 2. Cathode-ray oscillographs 3. Lightning photography.**—*W.N.*

## 1949

**4K–205** 551.515.4

Byers, Horace R., **Principal results of a comprehensive investigation of the structure and lynamics of the thunderstorm.** *Tellus*, 1(4):6–17, Nov. **1949.** 5 figs., 16 refs., eqs. **DWB**—Certain intensive investigations into the nature of thunderstorms in the U. S. have resulted in a new nodel of thunderstorm structure, life cycle and thermodynamics. Thunderstorms and their effects have been investigated by airplanes, radar, surface micronetworks and swarms of balloons. Some of the more significant aspects of these measurements are described. Sections discuss thunderstorm tructure and circulation, thermodynamics of entraining, thunderstorm weather near the surface, lectric fields, radar observations, effect of environment wind field, preferred areas of thunderstorm levelopment and squall lines. (*Same item as* H–205, Aug. 1950, *MAB.*) *Subject Headings:* **.. Thunderstorm dynamics 2. Thunderstorm electricity 3. Radar storm detection.**—*From author's bstract.*

**4K–206** 551.501.83:551.577

Duncan, P. F., **Precipitation static.** *Institute of Navigation, London, Journal*, 2(1):53–56, Jan. **1949. DWB**—Dust, ice, snow or rain, encountered by an airplane in flight, may build up static harges of as high as 400,000 volts. Sand, dust and smoke are the most likely to produce static, ce crystals next and raindrops least. Methods of reducing danger from brush discharges discussed. (*Same item as* 2.10–197, Oct. 1951, *MAB.*) *Subject Heading:* **1. Sferics from precipitation.**—*M.R.*

**4K–207** 551.501.83

Khastgir, S. R. and Roy, R., **Study of the wave-forms of atmospherics.** *Philosophical Magazine*, 4(310):1129–1143, Nov. **1949. DLC**—Experiments were carried out at the Physics Lab. of Dacca University in the summer (monsoon) of 1947. Elaborate equipment and observational methods are described. Oscillograms are analyzed and characteristics of 6 types of wave form listed quantitatively in detail, and the forms reproduced graphically from record. *Subject Headings:* **1. Sferics wave forms 2. Oscillograph records 3. Dacca, India.**—*M.R.*

**4K–208** 551.501.83:551.515.4

**Location of thunderstorms by radio.** *Nature*, London, 163:75, **1949.** 4 refs. **DWB**—Storm ocation network of the Meteorological Office in British Isles and "sferics" apparatus employed are described. (*Same item as* H–214, Aug. 1950, *MAB.*) *Subject Headings:* **1. Sferics thunderstorm ocation 2. Sferics networks 3. Sferics recorders.**—*H.P.K.*

**4K–209** 551.508.94:551.501.83

Kimpara, Atsushi, **Correlation of atmospherics with weather phenomena.** *Nagoya. University. Faculty of Engineering, Memoirs*, 1(2):1947–1957, Oct. **1949.** 7 figs., table, 6 refs. **DWB**—The origin of sferics was located by using 2 "instantaneous type direction finders" placed at a distance of 56 km from each other and applying a method of triangulation. The experiment was made at Iwatsuki and Kakioka (both situated in the Kanto Plains) in the fall of 1943. The apparatus and its operation are described. Three examples of successful measurement and coordination are given (Sept. 15, 19 and 20) and two diagrams presented for each of these days, one indicating the origin of sferics as determined by triangulation and the other showing the corresponding weather situation. Tables of directional distribution of sferics at the two stations are presented for the three days investigated. (*Same item as* 4.7–27, July 1953, *MAB.*) *Subject Headings:* **1. Sferics 2. Triangulation 3. Atmospheric electricity instruments.**—*G.T.*

**4K–210** 551.501.83:551.578.4:551.576

Norinder, Harald, **On the measurement and nature of atmospherics produced by electric discharges in snow squalls and from other sources.** *Tellus*, 1(2):1–13, May **1949.** 19 figs., 2 tables, 12 refs., 7 eqs. **DWB**—The intense electric fields generated in snow squalls and clouds from which snow is falling produce disruptive discharges which, though less intense and of shorter spark length than lightning discharges, are capable of producing atmospherics which may be measured by means of cathode ray oscillographs. Such oscillograms have a characteristic variation pattern that is distinct from those produced by lightning discharges. Theoretical discussion of genesis of atmospherics in snow clouds, principles and methods of measuring atmospherics, with equipment and resulting oscillograms reproduced in illustrations. Detailed discussion and illustrations of an actual case of snow squall clouds over Baltic near Institute of Uppsala. (*Same item as* 3–145, March 1950, *MAB.*) *Subject Headings:* **1. Sferics from snow 2. Sferics measurement 3. Sferics theory.**—*M.R.*

**4K–211** 551.501.81:551.515.3:551.501.83

**Tornado prediction.** *Newsweek*, 35(7):52, Aug. 15, **1949.** photo. **DLC**—Report of work being done at Oklahoma Institute of Technology, Stillwater, under the direction of CLARK A. DUNN and H. L. JONES, on tracing and predicting tornadoes by radar, which records a different picture of tornado lightning than of ordinary lightning. It is believed that a developing tornado can be detected 100 to 200 mi away. A method for plotting a storm's course is being developed. (*Same item as* E–117, May 1950 and 2H–153, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics tornado detection 2. Radar echoes from lightning 3. Tornado forecasting from sferics 4. Sferics on radar.**—*M.R.*

**4K–212** 551.501.83:551.510.535

Warmbt, W., **Atmosphärische Störungen auf Kurzwelle 9 MHz im Zusammenhang mit der Gewitterhäufigkeit.** [Atmospheric disturbances on the short wave 9 MHz in connection with thunderstorm frequency.] *Leipzig. Universität. Geophysikalisches Institut, Veröffentlichungen* Ser. 2, 15:228–240, **1949.** 5 figs., 9 refs. **DWB**—A general treatment of various kinds of disturbances in short-wave transmission with particular emphasis on relation between ionospheric disturbances and interference with propagation. Reception records made during the summer of 1944 are compared with frequency of thunderstorms reported in the German network. (*Same item as* 2.4–67 April 1951, *MAB.*) *Subject Headings:* **1. Ionospheric disturbances 2. Sferics from ionosphere 3. Sferics from thunderstorms 4. Germany.**—*M.R.*

**4K–213** 551.594.7:551.594.2

Workman, Everly J. and Reynolds, S. E., **Electrical activity as related to thunderstorm cell growth.** *American Meteorological Society, Bulletin*, 30(4):142–144, April **1949.** 7 refs. **DWB**—Twelve storm cells were studied. Visual and radar observations of electrical activity of clouds were carried out. Some tentative conclusions are presented. (*Same item as* H–231, Aug. 1950 and 2H–158, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radar observations 2. Sferics on radar 3. Radar storm detection 4. Thunderstorms.**—*W.N.*

## 1950

**4K–214** 551.594.7:551.501.8

Bender, Hertwig K., **Erfahrungen bei neueren Messungen der atmosphärischen Störungen des Funk-Empfangs vorzugsweise auf 9 MHz.** [Results of new measurements of atmospheric disturbances of radio reception, principally on 9 MHz.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 12:161–166, **1950.** 6 figs., 2 refs. **MH-BH**—Three methods of recording disturbances in wireless communication are described. Diurnal variation of static and influence of thunderstorms and fronts are discussed and a possible effect of penetrating cosmic rays considered. No connection was found with reflection or damping in the ionosphere. (*Same item as* 11–66 Nov. 1950, *MAB.*) *Subject Headings:* **1. Sferics sources 2. Diurnal sferics variations 3. Sferic recording methods.**—*C.E.P.B.*

**4K–215** 551.501.83:551.515.

Doury, P., **Essai d'étude statistique des sources d'atmosphériques en Europe et sur l'Atlantique Nord.** [Attempt at a statistical study of sources of sferics in Europe and the North Atlantic.] *Journal Scientifique de la Météorologie*, 2(6):56–64, April/June **1950.** 12 figs., 2 refs. French, English and Spanish summaries p. 56. **MH-BH**—Using data obtained from radiogoniometer stations in the British Isles (1944–1948), the author has prepared 12 charts, showing for each month the average distribution of sources of atmospherics from 30° to 70°N and from 40°E to 40°W long. On these charts, squares 5° (long.) by 2½° (lat.) are shaded according to six categories: <1, 1–4, 5–9, 10–19, 30–59 and >60 sources in each square. This shows the geographical distribution of sferics to be similar to that of thunderstorms (C. E. P. BROOKS, 1927) over the Atlantic and Europe. In summer practically no sferics originate over the Atlantic. In winter there are some maxima over the Bay of Biscay (>15) and to the SW and W, but these do not compare with the maxima over the continent (>78) in the spring, summer and fall or over the Mediterranean (>30) in winter. Great similarity was shown between the charts drawn for the same month in each year (and in 1944–1950 as well) and a gradual transition occurred from month to month. (*Same item as* 11–177, Nov. 1950, *MAB.*) *Subject Headings:* **1. Sferics source distribution 2. Statistic studies 3. Western Europe 4. North Atlantic.**—*M.R.*

**4K–216** 551.594.6:551.501.83(7

*Gerson, N. C., **Noise levels in the American Sub-Arctic.** *Institute of Radio Engineers, Proceedings*, 38(7):905–916, Aug. **1950.** 15 figs., 6 refs., eqs. **DLC**—The continuous measurements (about 150 kc/s) made at seven stations in Canada during Jan.–June 1947 reproduced readings within 10%. A receiver (Hammarlund Super Proc, BC-779 A) and an automatic recorder (Esterline Angu

ere used. The conclusions were: terrestrial sferics are generated in thunderstorms, probably by ransformation of heat energy; storms carrying particles that generate electric charges and potential radients and random noise produced by static field between the ground and immediately above, ay, although normally smaller, exceed the sferic noise from distant thunderstorm because of the cal corona produced. The major portion of sferics in middle and high latitudes comes from tropic nd sub-tropic areas. Conclusions are drawn as to daily and seasonal variations. *Subject Headings* **. Sferics from thunderstorms 2. Sferics sources 3. Sferics variations 4. North America.**—*W.N.*

**4K–217** 551.501.83:551.594.221

Golde, R. H., **"Sferics" and the lightning discharge.** *Meteorological Magazine*, London, 9(940):277–286, Oct. **1950.** 6 figs., 3 photos, 25 refs. **MH-BH**—An excellent account of the arious stages in a lightning stroke to earth and the field changes to which they give rise on the round. The faintly luminous step-leader stroke causes a gradual "a" field change as the negative harge is lowered to earth; the very rapid return stroke causes an equally rapid "b" change, followed y a gradual "c" change with removal of some of the remaining cloud charge. These give smooth eld changes within 50 km or so of the stroke. At distances of 400 km upwards induction and adiation due to the violent return stroke become important and introduce the oscillatory field hanges which are observed. The form of these is illustrated at distances of 400 to above 3000 km, nd the evaluation of their magnitude is set out. (*Same item as* 2.1–188, Jan. 1951, *MAB.*) *Sub- ect Headings:* **1. Sferics from lightning 2. Lightning discharges.**—*C.E.P.B.*

**4K–218** 551.515.4

†Israël, Hans and others, **Das Gewitter; Ergebnisse und Probleme der modernen Gewitter- orschung.** [The thunderstorm; results and problems of modern thunderstorm research.] *Probleme er kosmischen Physik*, Vol. 25, **1950.** 249 p. photos., diagr., graphs, bibliography 1939–49 (431 efs.). Introduction in German, French and English. **MH-BH**—A series of articles by noted erman meteorologists, providing a comprehensive compilation of knowledge about the meteorology f thunderstorms, theories on the origin of thunderstorm electricity, radioelectric disturbances aused by lightning or charges in clouds, and various other phases of thunderstorm activity (geo- raphical frequency, relation to solar activity, synoptic aspects, cloud physics, etc.) The separate rticles are by R. MÜGGE, H. SIEDENTOPF, O. DINKELACKER, H. WICHMANN, F. ROSSMAN. (*Same lem as* 3.9–8, Sept. 1952, *MAB.*) *Subject Headings:* **1. Thunderstorms 2. Thunderstorm electricity . Collected works 4. Thunderstorm bibliographies.**—*M.R.*

**4K–219** 551.508.85:551.501.83:551.515.3

Jones, Herbert L., **The identification and tracking of tornadoes.** Paper read at the Joint Meeting of the International Scientific Radio Union and Institute of Radio Engineers. Wash- ington, D. C., April **1950.** 12 figs. Mimeo. **DWB, MH-BH**—Research work at Oklahoma A. nd M. indicates the possibility of identifying and tracking tornadoes by means of characteristic ightning discharges. Evidence shows that electrical discharges from tornadoes are very different rom discharges observed during an ordinary thunderstorm; the tornado discharges are reputed to e more violent with an energy concentration in the blue end of the spectrum. Sferics during a ornado are observed to be much greater in magnitude than sferics resulting from other types of torms. New electronic equipment has been developed for recording only those sferics above a iven preset level. Direction indicating equipment has also been assembled for trial in spring of 950. (*Same item as* E–125, May 1950 and 2H–177, Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferics n radar 2. Sferics tornado detection 3. Sferics from tornadoes 4. Lightning discharges.**— *I.P.K.*

**4K–220** 551.501.83

Kennedy, E. Donald, **Weather and electronics research.** *Florida. University. Engineering nd Industrial Experiment Station, Engineering Progress*, 4(4); *Leaflet Ser.*, No. 13, April **1950.** p. 6 figs. Reprint from: *Journal of Southern Research*, Jan. **1950. DWB**—Major research rojects now in progress at the University of Florida include studies of microwave reflections from ainstorms (using radar) and sferics studies, that is the measurement of intensity and location of ources of atmospheric parasites in connection with thunderstorm areas and hurricanes. Location f thunderstorms at distances of 300 miles is possible, the author claims. Examples of records are ncluded. (*Same item as* 3.7–38, July 1952, *MAB.*) *Subject Headings:* **1. Meteorological research 2. Sferics storm detection 3. Microwave reflections. I. Florida. University. Engineering and ndustrial Experiment Station.**—*M.R.*

**4K–221** 551.594.7(68)

King, J. S.; Hewitt, F. J. and Bozzoli, G., **Radio meteorology in southern Africa.** (In: **African Regional Scientific Conference, Johannesburg, Oct. 17–28, 1949.** v. 2:41–44, **1950.** In English,

French summary p. 41.) **DWB**—A discussion of the development of radio meteorology in Sout Africa, of the use of sferics for detecting thunderstorms and the application of microwave rad for precipitation detection in South Africa. The author discusses also the use of radar for upp wind measurement, the influence of meteorological conditions upon radar waves, the meteorologic conditions likely to cause superrefraction, etc. A list of radiosonde stations operating in Sout Africa is given. (*Same item as* 3.10–34, Oct. 1952, *MAB.*) *Subject Headings:* **1. Radio meteorolog 2. Sferics on radar 3. Radar storm detection 4. South Africa.**—*I.L.D.*

**4K–222** 551.501.8

Kimpara, Atsushi and Inagaki, Takeo, **Origin of atmospherics in the Far East.** *Nagoy University. Faculty of Engineering, Memoirs,* 2(2):66–73, Oct. **1950.** 8 figs., 8 refs. Abstracte from reprint. **DWB**—A network of ten stations operating from Oct. 1943 to Dec. 1944 over Jap and the Pacific Islands for the purpose of locating origins of atmospherics is described and shown on map. Equipment and direction finding methods are discussed. Results obtained in locatir sources of sferics are summed up and the seasonal distribution of such sources is shown on chart Weather conditions from which migratory sferics originate are described and charts of two synopt situations over the Far East and corresponding directional distribution of sferics in Tokyo presente The effect of power lines and other ground conditions on the accuracy of direction finding equipme is specified in an appendix. (*Same item as* 4.3–293, March 1953, *MAB.*) *Subject Heading* **1. Sferics source location 2. Sferics distribution 3. Sferics networks 4. Far East.**—*G.T.*

**4K–223** 551.501.81:551.501.83:551.594.

Ligda, Myron G. H., **Lightning detection by radar.** *American Meteorological Society, Bulleti* 31(8):279–283, Oct. **1950.** 6 figs., 4 refs. **MH-BH**—A method of lightning detection by rad was worked out in 1945 by U. S. Air Weather Service observers. The Weather Radar Project M.I.T. verified conclusions of SWEENY and PETERSON and took the first radar photographs of ligh ning strokes. Equipment described in PPI scope of SCR-615-B radar reproduced. Value lies ability to locate cells in a cloud mass which are electrically active. (*Same item as* 2.3–174, Mar 1951, and 2H–184, Aug. 1951, *MAB.*) *Subject Headings:* **1. Radar storm detection 2. Sferics radar 3. Sferics from lightning 4. Radar photographs 5. Radar equipment**—*M.R.*

**4K–224** 551.594.7:551.509

Lugeon, Jean, **L'essor de la radiométéorologie mondiale et la prévision du temps.** [T progress of world radio meteorology and weather forecasting.] *Archiv für Meteorologie, Geophys und Bioklimatologie, Ser. A,* 3(1/2):120–138, **1950.** 2 figs. French, German and English summari p. 120–121. **DWB**—Author sets out the history of investigations of sferics in synoptic meteorolog The various international organizations concerned and the resolutions passed by them, are liste Instrumental methods are briefly described; the knowledge obtained and its applications to the stu of thunderstorms, radiotelegraphy and forecasting are listed. The organization of a radiometeo logical network is set out, with the Argentine as an example. Finally, reference is made to sferi codes. (*Same item as* 2.2–169 and 2H–185, Feb., Aug. 1951, *MAB.*) *Subject Headings:* **1. Sferi codes 2. Sferics research 3. Weather forecasting from sferics 4. Radiometeorological network —***C.E.P.B.*

**4K–225** 551.594.6 551.501.

Meinhold, H., **Funkstörungen.** [Radio disturbances.] (In: Israel, H. and others: D **Gewitter.** [The thunderstorm.] Leipzig, **1950.** p. 126–139. 10 figs., 11 refs.) *Probleme Kosmischen Physik,* v. 25. **MH-BH**—A systematic review of radio disturbances, distinguishi between: hissing, (precipitation static) caused by the discharge of the antenna in the field of mospheric electricity; grinders, which are of no meteorological interest; thermic radiation of cosn origin and the clicks caused by electrical discharges in the troposphere. Weather forecasting c be improved by recording the magnitude and direction of clicks (sferics). The diurnal variati of atmospherics can be explained as the resultant of thunderstorm and reception probability, that during the night very distant thunderstorm regions can be detected, especially on 3–10 MI *Subject Headings:* **1. Sferics thunderstorm detection 2. Weather forecasting from sferics.**—*A.A.*

**4K–226** 551.501.83:551.594.

Newman, M. M., **Lightning atmospherics transients investigation of the Lightning and Tra sients Research Institute, Minneapolis, Minnesota.** (In: **Thunderstorm electricity.** Chica University. Dept. of Meteorology, Oct. **1950.** p. 249–275. 12 figs.) **DWB**—Author descril the high voltage generator producing artificial lightning, an experimental airplane set-up for studyi radio interference and the masking of wave shapes by measuring apparatus in oscillographic studi (*Same item as* 3.9–234, Sept. 1951, *MAB.*) *Subject Headings:* **1. Sferics from lightning 2. La oratory experiments.**—*I.L.D.*

**4K–227** 551.594.221

Norinder, Harald, **Duration of lightning strokes and occurrence of multiple strokes.** *Tellus*, 1):24–34, Feb. **1950.** 19 figs., 4 refs. **DWB**—Variations in duration of number of and time terval between lightning strokes are studied by means of electromagnetic records made at some stance from the strokes. This method is considered superior to the former method of photo- aphing strokes to a tall building or similar object in or out of the laboratory, as the presence of the ject materially alters the electromagnetic field of the earth and cloud. Graphs and histograms ow frequencies of measured variations; many actual records of successive lightning strokes are produced. It is stated that, owing to lower thermodynamic intensity in high latitudes lightning rokes are less intense than in lower latitudes. (*Same item as* 6–106, June 1950, *MAB.*) *Subject eadings:* **1. Sferics from lightning 2. Lightning discharges 3. Sweden.**—*M.R.*

**4K–228** 551.594.2 551.501.83

Schonland, B. F. J., **The flight of thunderbolts.** Oxford, Clarendon Press, **1950.** 152 p. 33 gs., 6 plates. Price: 15s. **MH-BH**—Full account is given of sferics and the maintenance of the rth charge. (*Same item as* 11–172, Nov. 1950, *MAB.*) *Subject Headings:* **1. Sferics from light- ng 2. Thunderstorm electricity 3. Lightning.**—*C.E.P.B.*

## 1951

**4K–229** 551.501.83:551.594.21:551.594.7(09)(47)

Bazikaĭlo, V. A., **A. S. Popov—osnovopolozhnik sovremennoĭ radiometeorologii.** [A. S. opov—the originator of modern radio meteorology.] *Priroda*, Moscow, 40(11):70–72, Nov. **1951.** refs. **DLC**—In 1895, A. S. Popov exhibited a device capable of detecting thunderstorms within a dius of 40 km (*see* 4K–1 above), recorded processes leading to the formation of cumulus clouds id, in general, electrical disturbances in the atmosphere. The article describes Popov's activities the field of radio meteorology and lists his papers in this field. (*Same item as* 3.8–36, Aug. 1952, *AB.*) *Subject Headings:* **1. Radio meteorology 2. Atmospheric electricity 3. Sferics 4. Popov, S. 5. History of radio meteorology 6. U.S.S.R.**—*I.L.D.*

**4K–230** 551.594.221

Bossolasco, Mario, **Quelques résultats d'observation des décharges atmosphériques dans talie du Nord.** [Some results of the observation of atmospheric discharges in Northern Italy.] *eofisica Pura e Applicata*, 20:181–182, July/Dec. **1951.** 4 refs. In French; English summary 181. **MH-BH**—Using the Gane and Schonland ceraunometer (lightning recorder) at several aces in northern Italy and tabulating the results which are indicative of the number of discharges a radius of 20 km from the station, the author concludes that the number of cloud-ground dis- iarges (0.25 per square km per year) is much smaller than has been estimated by other authors r less thundery regions and that such discharges usually occur with precipitation and are most equent during hail storms. Cloud-ground discharges always occur in groups of two or more. requency is greater in northern Italy than on the Riviera and depends on other factors than co- titude as Norinder (*see* 4K–227 above) supposed. (*Same item as* 3.5–279, May 1952, *MAB.*) *ubject Headings:* **1. Lightning frequencies 2. Sferics from lightning 3. Ceraunometers 4. North- n Italy.**—*M.R.*

**4K–231** 551.501.83

Budden, K. G., **I. The propagation of a radio-atmospheric.** *Philosophical Magazine*, Ser. 7, 2(324):1–19, Jan. **1951.** 7 figs., 15 refs., 10 eqs., 2 appends. **DLC**—The propagation of sferics epends on the nature of the boundaries of the wave-guide. Since the ionosphere is an imperfect nductor, the distance critical frequency and other properties of transmission will vary and the npulses will be distorted at great distances from the source. It is shown that the nature of the ource is not important. The model worked out in this paper is idealized and shows the fractional duction in intensity at 1000 km for various frequencies, and the wave form and other features r long waves. (*Same item as* 2.8–171, Aug. 1951, *MAB.*) *Subject Heading:* **1. Sferics prop- gation.**—*M.R.*

**4K–232** 551.501.83

Bureau, Robert and Vaury, Jean Jacques, **Enregistrement des atmosphériques à bord du ommandant Charcot, Campagne 1950–1951.** [Recording of sferics on board the "Commandant harcot," Expedition 1950–1951.] *Académie des Sciences, Paris, Comptes Rendus*, 233(18):1049–)51, Oct. 29, **1951.** graph. **DWB**—Account of sferics recordings made during the 3rd expedition the French vessel "Commandant Charcot" to the Antarctic region and across the Pacific Ocean. ecordings were made with a mean value recorder and a cathodic goniometer. African and Ameri- n continental sferics centers were located and data obtained for sparsely explored regions of the

Pacific. Results are discussed in general terms. A sample recording is presented. (*Same item a* 4.1–270, Jan. 1953, *MAB.*) *Subject Headings:* **1. Sferics from distant sources 2. "Commandar Charcot" Cruise.**—*G.T.*

**4K–233** 551.501.83:551.508.9

Carbenay, Fernand, **L'action statistique des atmosphériques sur un récepteur accordé sur 2 kc./sec.** [Statistical action of atmospherics upon a receiver tuned to 27 kc/sec.] *Académie d Sciences, Paris, Comptes Rendus*, 232(10):949–950, March 5, **1951.** fig., 4 refs. See also: *Ibid* 224:1624, **1947**; 226:1710–1712, May 24, **1948**; 227:337–339, Aug. 2, **1948** and 230:1648–165 May 8, **1950. DLC, DWB**—In the earlier articles the author describes the construction of a 2 kc/sec sferics receiver-recorder which made it possible to register the mean level of intensity signals received by the antenna, and the scale of sensitivity either non-directional or direction In the final article the results obtained by the National Radioelectric Laboratory working in conne tion with cinema photography by R. Bureau (at Bagneux) are given. Two examples present show that the mean level of atmospherics thus recorded is independent of band width if the sensitivi index is kept constant (i.e., at 100 Maxwells). The method will be extended to higher frequencies see if the conclusions still hold. The height of the ordinate on the record depends on the rate succession (frequency) of impulses. (*Same item as* 3.2–199, Feb. 1952, *MAB.*) *Subject Heading* **1. Sferics recorders 2. Sferics intensities.**—*M.R.*

**4K–234** 551.515.33:551.501.

Jones, Herbert L., **A sferic method of tornado identification and tracking.** *American Meteor logical Society, Bulletin*, 32(10):380–385, Dec. **1951.** 5 figs. **MH-BH**—The physical basis for t possible use of sferics resulting from tornadoes, for distinguishing them from other types of storr and for tracking them is discussed. The apparatus, which consists of a superheterodyne receiv and a cathode ray oscilloscope for receiving the sferic impulses and a camera, is described and circuit diagram is given. The operation of the apparatus, its most suitable location and the resu obtained during 1950 and the program for 1951 are discussed. Photographs of oscillograms typi of thunderstorms are given. (*Same item as* 3.7–110, July 1952, *MAB.*) *Subject Headings:* **1. T nado tracking by sferics 2. Sferics from tornadoes 3. Sferics equipment.**—*I.L.D.*

**4K–235** 551.508.94:551.501.

Kessler, William J. and Smith, Sydney E., **An atmospherics wave form receiver.** *Instit of Radio Engineers, Proceedings*, 39(6):676, June **1951. DLC**—A driven-sweep oscillograph signed for sferics wave forms, from which location of thunderstorms can be investigated, is describe Illustrative examples are presented of: 1) characteristic wave form during night, 2) multiple retu from lightning discharges associated with an overhead thunderstorm and 3) wave forms receiv under similar conditions with an expanded time scale. *Subject Headings:* **1. Sferics wave for 2. Sferics wave form recorders 3. Sferics thunderstorm location.**—*W.N.*

**4K–236** 551.501.8:551.515.2(2

*Kimpara, Atsushi, **The typhoon Kezia and atmospherics.** *Imperial Academy, Tokyo, Proce ings*, 27(7):366–370, July **1951.** table, fig. In English. **DWB.** Also: *Journal of Geomagneti and Geoelectricity*, Kyoto, 3(2):25–31, July **1951. DLC, DWB**—Referring to his study on atm pherics carried on since 1928, the author offers some data and conclusions reached in his rec investigations of the correlation between frequency of sferics and aerological conditions at 3 k He finds that sources of sferics are mainly scattered over the area of conditional instability in wh frontal thunderstorms or air-mass thunderstorms may develop. Data on the distribution of sour of sferics in the neighborhood of the typhoon Kezia are presented in a table and found to follo pattern similar to those observed during the typhoon Kitty, and to coincide with the movem of various air masses. (*Same item as* 4.7–228, July 1953, *MAB.*) *Subject Headings:* **1. Sferics fr typhoons 2. Typhoon "Kezia," 1950 3. Sferics source distribution 4. Western Pacific Ocean** *G.T.*

**4K–237** 551.510.535:523.75:550

McIntosh, Douglas Haig, **Geomagnetic solar flare effects at Lerwick and Eskdalemuir relationship with allied ionospheric effects.** *Journal of Atmospheric and Terrestrial Physics*, 1(5 315–342, **1951.** 3 figs., 22 tables, 19 refs. **DWB**—The geomagnetic effects of solar flares crochets) over the period 1936–1949 are tabulated and identified. An equinoctial maximum occurrence is observed. Midday is the hour of greatest frequency. The relationships betw geomagnetic effects and flares, fade outs, sudden increase in sferics, etc. are examined. A gen discussion of the phenomena is given. (*Same item as* 4.3–105, March 1953, *MAB.*) *Subject He ings:* **1. Terrestrial magnetism 2. Solar flares 3. Ionosphere 4. Sferics 5. Lerwick, Scotl 6. Eskdalemuir, Scotland.**—*A.A.*

**4K–238** 551.508.94:551.501.83

Maidens, A. L., **An automatic selecting device for "sferics" observations.** *Meteorological agazine*, London, 80(952):281–282, Oct. **1951. MH-BH**—Briefly describes an equipment to ke a random selection of sferic signals exceeding a limiting value, and to give an audible warning that the bearings can be read, transmitted and recorded. (*Same item as* 3.4–40, April 1952, *AB.*) *Subject Heading:* **1. Sferics recorders.**—*C.E.P.B.*

**4K–239** 551.501.83:551.594.22

Meinhold, Heinz, **Die atmosphärischen Störungen.** [Sferics.] *Angewandte Meteorologie*, 3):70–77, Dec. **1951.** 12 figs., 9 refs., 10 eqs. **DWB**—Atmospherics are due to lightning. Anal and geographical distribution of thunder is discussed: maximum lightning frequency 30/sec. e rapid changes of current in the lightning channel radiate impulses which take up a damped e curve. The range of various wave lengths is discussed; at night it increases to some 1000 km in 15 MHz. The energy radiated is discussed and various constants defined. (*Same item as* 3.4–256, ril 1952, *MAB.*) *Subject Heading:* **1. Sferics from lightning.**—*C.E.P.B.*

**4K–240** 551.501.83:551.509.34:551.515.4:551.508.94(4)

Meinhold, Heinz, **Die Peilung atmosphärischer Störungen zum Zwecke der Wetterprognose.** he radiolocation of atmospheric disturbances from the point of view of weather forecasting.] *rmany. Deutscher Wetterdienst in the U.S.-Zone, Berichte*, No. 26:3–8, **1951.** charts, diagram, phs, refs. **DWB**—Two methods of location of areas of convective activity through recordings sferics sources (usually from lightning discharges) are described and illustrated: 1) By means of the hode ray direction finder (radiogoniometer) due to Sir Robert A. Watson-Watt, and 2) with Lugeon "Schmalsektorpeiler" (*see* 4K–183 above). If goniometer readings are obtained m three stations along the coast, storms or areas of activity several hundred miles at sea can be ated. Other factors which correlate with sferics activity, such as temperature and wind at h levels, can also be forecast. (*Same item as* 4.2–34, Feb. 1953, *MAB.*) *Subject Headings:* **Thunderstorm forecasting from sferics 2. Sferics thunderstorm detection 3. Radiogoniometers Western Europe. I. Watson-Watt, Sir Robert A. II. Lugeon, Jean.**—*M.R.*

**4K–241** 551.501.83:551.594.22

Meinhold, Heinz, **The wave form of atmospherics.** *Geofisica Pura e Applicata*, 19(3/4):173–5, **1951.** 2 figs., 5 refs., eqs. In English; English and German summaries p. 173. **MH-BH**—easurement of frequency distribution of sferics from lightning strokes a hundred kilometers away ows that the empirical wave form can be obtained by propagation mechanisms near the ground cluding reflections from the ionosphere), wherein the higher frequencies are damped out. Also wave form of the original lightning stroke cannot be determined from the wave form of the sferics. *me item as* 3.2–192, Feb. 1952, *MAB.*) *Subject Headings:* **1. Sferics wave forms 2. Sferics from htning.**—*M.R.*

**4K–242** 551.501.83:551.509.1(02)

U. S. Air Weather Service, **Sferics code.** *U. S. Air Weather Service, Manual* 105-29, March **51.** 10 p. 2nd ed. Sept. **1953.** Effective Jan. 1, 1954. **DWB**—A manual giving instructions d code form to be used by U. S. Air Weather Service units in coding and decoding sferics data for nsmission or use in synoptic analysis. The WMO (IMO) has no approved sferics code at this e. Great Britain has one similar to this U. S. code. France and colonies and Switzerland use ifferent code. Details of both the British and the French (ATMOS) codes are given in a supplentary section of this manual. (*Same item as* 3.1–49, Jan. 1952, *MAB.*) *Subject Headings:* **Synoptic codes 2. Sferics codes 3. Code manuals.**—*M.R.*

**4K–243** 551.501.83:551.515.4

†Wanta, Robert Casimir, **Sferics.** (In: **Compendium of meteorology.** Boston, American teorological Society, **1951.** p. 1297–1300. 41 refs.) **MH-BH**—The subject of this review is the ics found at a distance from "sudden electrical discharges resulting in distribution of charge hin and between clouds, between clouds and the air space above or below, and between clouds d earth." The author reviews the history of the observations of sferics and their relation to nderstorms; the direction finding system of Watson-Watt and Lutkin; the acuracy of determina- n of bearings of sferics; and the value of sferics to meteorologists, particularly their use in detecting nderstorms and in weather forecasting. (*Same item as* 4.5–13, May 1953, *MAB.*) *Subject adings:* **1. Sferics from thunderstorms 2. Sferics thunderstorm detection 3. Compendium icles.**—*I.L.D.*

**4K–244** 551.501.83

Zetroner, W. F. and Kessler, W. J., **A note on the similarity of certain atmospheric waveforms.** *nklin Institute, Journal*, 252(2):137–141, Aug. **1951.** 3 figs. **DLC**—The initial results of one

phase of the comprehensive study (Oct. 1948–May 5, 1949) showed a remarkable uniformity of wave forms of sferics from centers of thunderstorm activity. Photographic recordings of 104 wave forms taken at nighttime April 1949 gave 55% of uniform display. Daylight observations of 520 wave forms taken as a surface cold front passed the edge of the Gulf Stream (March 10 1949) showed 41% of similar wave forms. The latter observations were classified into 2 groups 1) those with a first positive peak and 2) those with a first negative peak. The comparison showed that 80% fell into group 1, and if group 2 was inverted so that the first peak coincided with that of group 1, a close matching was obtained. *Subject Heading:* **1. Sferics wave forms.**—*W.N.*

## 1952

**4K–245** 551.510.535:551.501.83:621.396

Caton, P. F. G. and Pierce, E. T., **The waveforms of atmospherics.** *Philosophical Magazine*, London, Ser. 7, 43(339):393–409, April **1952.** 14 figs., table, 14 refs., 4 eqs. **DWB**—A number of waveforms observed at Cambridge, Eng., are illustrated, and the technique of photography is described. The forms are classified into 8 types, their occurrence described and origin discussed (initial leader, return strokes, etc.). The theory of multiple ionospheric reflections is considered; about 10% of the records give precise values of the height (about 85 km) and distance of reflection. (*Same item as* 4.1–88, Jan. 1953, *MAB.*) *Subject Headings:* **1. Sferics wave forms 2. Sferics reflections from ionosphere 3. Sferics wave form photography 4. Cambridge, England.**—*C.E.P.B.*

**4K–246** 551.501.83:551.515.4

Haff, Robert S. and Johnson, Raymond C., **A statistical approach to the measurement of atmospheric noise.** *Institute of Radio Engineers, Proceedings,* 40(2):185–187, Feb. **1952.** fig., graphs, eqs. **MH-BH**—The amplitude-probability-distribution method was adopted and developed by studies carried out since May 1946 at the University of Florida. The method is promising for investigation of sferics from thunderstorms. The results were compared, on a statistical basis, with measurements obtained by other methods. The low frequency data obtained were discussed. *Subject Headings:* **1. Sferics measurement 2. Sferics from thunderstorms 3. Statistical technique 4. United States.**—*W.N.*

**4K–247** 551.515.3:551.501.8

Jones, Herbert L., **Identifications of tornadoes by observation of waveform atmospherics.** *Institute of Radio Engineers, Proceedings,* 40(9):1049–1052, Sept. **1952.** 9 figs. **MH-BH**—Research at Oklahoma Agricultural and Mechanical College has been conducted since 1947. Characteristics of sferics resulting from tornadoes differ from thunderstorm sferics. It was found that the majority of the lightning in the vicinity of a tornado cloud formation occurred in the small region that included the tornado funnel. The preponderance of high frequency components was noticed. This was never observed in thunderstorms. *Subject Headings:* **1. Sferics wave forms 2. Sferics from tornadoes 3. Sferics tornado detection 4. United States.**—*W.N.*

**4K–248** 551.501.81:551.501.83:551.594.22

Miles, V. G., **Radio echoes and lightning.** *Nature,* London, 170(4322):365–366, Aug. 30, **1952.** fig., ref. **DWB**—Brief note of unusual echoes on 10 cm radar, simultaneous with lightning flashes in S. Rhodesia. *Subject Headings:* **1. Sferics on radar 2. Sferics from lightning.**—*C.E.P.B.*

**4K–249** 551.501.83:551.515.4

Pierce, E. T., **The radio location of thunderstorms.** *American Meteorological Society, Bulletin* 33(6):243, 246, 263, June **1952. MH-BH**—A brief note on studies carried out at the Univ. of Cambridge in order to derive the distance D of thunderstorms by wave form analysis and to determine the position by means of a single direction finding station. Only wave forms generated during return strokes, which are of a regular oscillatory character, were analyzed. The oscillatory atmospherics are interpreted either "by considering the oscillations as generated by the multiple reflection of an original disturbance between the ground and an atmospheric layer of constant height $h$ (the "ray" picture) or by investigating the propagation of primary pulse in the wave-guide formed by the earth and ionosphere." It is concluded that distance determination from an atmospheric wave form on the basis of a simple ray theory cannot at present supersede multi-station techniques. The simple ray theory is useful only for regular peaked wave forms that occur at night. "These atmospherics are subject to inaccuracies in wave finding and geographical limitation in incidence, while only a small proportion give accurate values of D." *Subject Headings:* **1. Sferics wave forms 2. Sferics thunderstorm detection 3. Sferics theory.**—*I.L.D.*

**4K–250** 551.501.83:551.594.6:551.594.22

Schumann, Winfried Otto, **Über die Ausbreitung sehr langer elektrischer Wellen und der Blitzentladung um die Erde.** [On the propagation of very long electric waves and of lightning

ischarge around the earth.] *Zeitschrift für angewandte Physik*, 4(12):474–480, **1952.** 3 figs., 1 refs., 18 eqs. Also in: *Il Nuovo Cimento*, 9(12):1116–1138, Dec. 1, **1952. DWB, DLC**—The quations of G. N. WATSON (1919) for the spread of electric waves round an earth with concentric onosphere are simplified and applied to very long waves (30–30,000 km). The resulting approxima- ion is applied to calculate the frequency spectrum of a lightning discharge at distance D. The vave length of maximum intensity varies with $D^2$ but the intensity falls off very slowly with in- reasing wave length. The time variation shows a sharp positive peak followed by a small negative alf wave decreasing slowly. Applicability to atmospherics is shown. *Subject Headings:* **1. Sferics rom lightning 2. Long wave propagation 3. Lightning discharges.**—*C.E.P.B.*

**4K–251** 551.508.94:551.501.83

Tantry, B. A. P., **An automatic atmospherics recorder.** *Journal of Scientific and Industrial Research, Ser. B*, 11(6):218-220, June **1952.** 2 figs., refs., eqs. **DWB**—Description of an automatic ecorder developed at the laboratory of Benares Hindu Univ. to obtain the wave forms of natural nd artificial sferics. Oscillograms show: 1) clear evidence of a slow periodic component of a few nilliseconds duration per cycle, 2) a slow component associated with the "leader" stroke and 3) the haracteristic forms of multiple reflections between the earth and the ionosphere. *Subject Heading:* **. Sferics wave form recorders.**—*W.N.*

## 1953

**4K-252** 551.594.7:06 551.501.83:551.515.4

Ashford, Oliver Martin, **Location of thunderstorms.** *World Meteorological Organization, WMO Bulletin*, 2(3):67–70, July **1953. DWB**—Report on a session of the Working Group on Radio- lectric Meteorology of the WMO Commission for Aerology held at Zurich from 17 to 24 March 953. The meeting was attended by scientists from 9 countries who described their work in the ield of thunderstorm location by means of sferics. The statements made by the international uthorities are summed up briefly. *Subject Headings:* **1. Sferics thunderstorm location 2. WMO Commission for Aerology.**—*G.T.*

**4K–253** 551.594.6:551.501.83

Chapman, F. W. and Matthews, W. D., **Audio frequency spectrum of atmospherics.** *Nature*, London, 172(4376):495–496, Sept. 12, **1953.** 3 figs., 4 refs. **DLC**—Analysis of relative amplitude f frequency components of sferics at 250–2000 km from origin, showing displacement of peaks of 'slow tail" and higher frequency oscillatory part. Day and night results differ. *Subject Headings:* **. Radio noise 2. Sferics.**—*C.E.P.B.*

**4K–254** 551.501.83:551.594.221

Haslett, A. W., **Research report. Whistling atmospherics.** *Science News*, London, 29:104–109, Aug. **1953.** 2 refs. **DWB**—L.R.O. STOREY found that at Cambridge, England, "long whistlers" f 0.4–10 kc are preceded by "clicks" and originate in lightning flashes within 1000 km. Short whistlers are not preceded by clicks and are attributed to lightning in opposite region of S. Hemi- phere. Repetitions of both are due to journeys round the world. Annual variations of relative requencies are supported by annual variation of thunderstorms. *Subject Headings:* **1. Sferics from ightning 2. Sferics types.**—*C.E.P.B.*

**4K–255** 551.501.83:551.515.4

Holzer, Robert E., **Simultaneous measurement of sferics signals and thunderstorm activity.** In: **Thunderstorm electricity.** Chicago, Univ. of Chicago Press, **1953.** p. 267–275. 6 figs., 4 refs.) **DLC**—A study was made in Aug.–Nov. 1945 at the Univ. of New Mexico and vicinity to determine he relationship between sferics records and actual observations of distant thunderstorms. A nobile sferics station was built and operated by the U. S. Signal Corps, and was linked with the ixed sferics station at Albuquerque by radio. It was found that stroke patterns on the recorder were closely linked with storm types. The non frontal storms had less energy and reached only 30–35 thousand feet; the frontal type had greater energy and reached 50,000 ft at least. Sferics rom distant storms were seldom from cloud to cloud strokes but nearly always from ground strokes. Thus, sferics records are usually of the more intense storms. The characteristics of patterns of listant storms as determined by path of signal (whether or not repeated reflections from the iono- phere have occurred) and the energy and time intervals are analyzed statistically for the few cases bserved and recorded. Storms were located accurately up to 1375 km (Arkansas). *Subject Headings:* **1. Sferics from thunderstorms 2. Sferics from distant sources 3. Sferics networks.**—*M.R.*

**4K–256** 551.501.83:551.576.1:551.515.4(52)

§*Isikawa, Haruzi and Takagi, Masumi, **On the atmospherics from a summer cumulo-nimbus. Pt. I. The change of discharge types in the life of a summer cumulo-nimbus. Pt. II. The nature**

**of the discharges in the cloud computed from the wave form analysis.** *Nagoya. Univ. Research Institute of Atmospherics, Proceedings*, 1:12–30, Jan. **1953.** figs., photo., refs. **DWB**—No fundamental difference was found between these wave forms and those from violent thunderstorms. Discharges within a growing cumulonimbus are believed to produce special wave form sferics, characteristics of which led H. NORINDER to conclude (1949) that predictions of snow-squalls associated with thunderstorms are feasible. These characteristics were analyzed from the observational results of a cumulonimbus visible for several days above the city of Maebasi (Japan) in the summer of 1952 without developing into clear thunderstorm. A cathode-ray oscillograph and three Boys cameras were used. It was found that the young cloud produced sferics of the dartleader or partial discharge type, turning into the step-leader type (no audible thunder) as it grew and, finally, into the main stroke type. *Subject Headings:* **1. Sferics wave forms 2. Cumulonimbus development 3. Sferics from thunderclouds 4. Lightning properties 5. Cathode-ray oscillographs 6. Boys camera 7. Japan.**—*W.N.*

**4K–257** 551.594.6:621.396 551.501.83

Isted, G. A., **Multiple bursts of signal in long-distance very-high-frequency propagation.** *Nature*, London, 171(4353):617-618, April 4, **1953.** fig. **DWB**—Describes a succession of signal bursts between 0.1 and 1 sec with amplitude up to 30 db greater than mean continuous signal on 40–60 Mc/s band. Many were identified with meteors but greatest frequency occurred in thunderstorm of Oct. 24, 1952. Probably associated with "whistlers" in static. *Subject Headings:* **1. Radio noise bursts 2. Sferics from thunderstorms.**—*C.E.P.B.*

**4K–258** 551.501.83

Iwai, Akira and Nakai, Teketoshi, **Unidirectional direction finder of atmospherics.** *Nagoya Univ. Research Institute of Atmospherics, Proceedings*, 1:50–53, Jan. **1953.** 6 figs. **DWB**—Description and discussion of the operational capabilities of a developed device. The illustrations presented show that all requirements are satisfied for the three systems A, B and C of which A generates a rectangular wave for a fixed interval synchronizing with sferics, B generates a rectangular wave at every half sferics cycle, and C does the same when the intensity of sferics exceeds a certain fixed intensity. *Subject Headings:* **1. Sferics direction finders 2. Sferics wave forms 3. Japan.**—*W.N.*

**4K–259** 551.508.94:551.501.83

Iwai, Akira; Nakai, Taketoshi and Murata, Tomoji, **W-60 type atmospherics waveform recorder.** *Nagoya. Univ. Research Institute of Atmospherics, Proceedings*, 1:63–70, Jan. **1953.** 5 figs. **DWB**—A complete description is given of the apparatus developed to meet the requirements of analysis of the true wave form in terms of the energy radiated from a lightning flash. These requirements were met with the aperiodic amplifier operating from 50 c/s to 80 kc/s. The 16 mm film, moves automatically after each exposure and may take 60 exposures per minute. Synchronization with cathode ray direction finders is possible. *Subject Headings:* **1. Sferics wave form records 2. Lightning properties 3. Japan.**—*W.N.*

**4K–260** 551.508.83

Iwai, Akira; Ito, Kichinosuke; Tanaka, Tsutao and Ebuchi, Tadateru, **Direction finder of atmospherics.** *Nagoya. Univ. Research Institute of Atmospherics, Proceedings*, 1:54–62, Jan. **1953.** 12 figs. **DWB**—Detailed explanation in text and diagrams is given of this portable instrument that operates accurately on 8–13 kc/s. Tests showed that sferics intervals >10 Mc were shown perfectly by timing marks on the films; the screen images were linear, slightly ecliptical at night hours and more eccentric at sunset and sunrise. *Subject Headings:* **1. Sferics direction finders 2. Japan.**—*W.N.*

**4K–261** 551.501.83:551.515:551.576(52)

Kamada, Tetsuo, **Correlation of origins of atmospherics with the vertical instability of atmosphere.** *Nagoya. Univ. Research Institute of Atmospherics, Proceedings*, 1:99–102, Jan. **1953.** 2 figs., 2 tables, 5 refs. **DWB**—This theoretical attempt was made in order to evaluate the number of jouls/kg required for generating sferics and to explore the quantitative correlation of its occurrence with the vertical instability of the atmosphere. It was estimated that sferics from within cumulonimbus are observable when the unstable energy exceeds 400 jouls/kg. *Subject Headings:* **1. Sferics origin 2. Vertical instability 3. Sferics from cumulonimbus clouds 4. Sferics theory 5. Japan.**—*W.N.*

**4K–262** 551.501.83:551.594.221

Kamada, Tetsuo, **Some notes on the record of multiple strokes obtained with the atmospherics direction finder.** *Nagoya. University. Research Institute of Atmospherics, Proceedings*, 1:90–98, Jan. **1953.** 9 figs., 9 tables, 5 refs. **DWB**—Analysis the origin of sferics, as recorded simultaneously

t Touokawa City and Nagoya City, indicated the pressure of 80% single and 20% multiple lightning trokes. Statistical treatment of the multiple strokes includes distribution function, discharge nterval, duration types and correlation with weather phenomena. The latter is exemplified by bservations from typhoon Kezia in which region the mean value of multiple strokes was 30%. 'he C.R.D.F. method was found useful. The majority of multiple strokes was 2:4, frequency of ntervals was in the range of 0.03 to 0.06 sec and duration from 0.06 to 0.15 sec. The multiple trokes occurred most frequently in frontal type lightning. *Subject Headings:* **1. Sferics from light-ing 2. Sferics direction finders 3. Lightning properties 4. Multiple lightning strokes 5. Ty-hoon "Kezia," 1950 6. Japan.**—*W.N.*

**4K–263** 551.501.83:551.515.8(52)

*Kimpara, Atsushi, **Atmospherics due to fronts in the upper atmosphere.** *Nagoya. Univ. Research Institute of Atmospherics, Proceedings*, 1:45–49, Jan. **1953.** 6 figs., table, 4 refs. **DWB**—Extensive observations of the zonal distribution of sferics and simultaneous meteorological upper air and ground observations were conducted around the year off the coast of Japan in the Pacific Ocean. The studies included the central Pacific Ocean, Tibet, E. Turkistan and Mongolia assuming (for lack of reliable meteorological information) the existence of polar fronts above these regions. It is concluded from the results presented that the sferics in the area 80° to 180°E long., 30° to 40°N lat., originate in the convergence regions of the polar fronts (under the jet streams in the westerlies). Further studies promise information on characteristics and location of polar fronts and jet streams. *Subject Headings:* **1. Sferics sources 2. Sferics from fronts 3. Jet stream 4. Japan 5. Tibet 6. Turkistan 7. Mongolia.**

**4K–264** 551.501.83:551.515.2(52)

*§Kimpara, Atsushi, **The typhoon Ruth and atmospherics.** *Nagoya. University. Research Institute of Atmospherics, Proceedings*, 1:40–44, Jan. **1953.** 7 figs., 4 refs. **DWB**—The life cycle of the typhoon Ruth (Oct. 1951) and the principal features of the accompanying sferics are discussed and compared with those of the typhoon Kezia (Sept. 1950). Kezia's sferics sources were mainly on its right quadrants whereas Ruth's were also in the convergence zone in front of the W and E trough at 500 and 700 mb. The zonal distribution of sources of sferics resulting from convergence may suggest the position of the jet stream. The observed sferics in the sub-tropical region (including the Philippines and Formosa) as resulting from thunderstorms, showers, cumulo-nimbus, etc. and the sferics off the coast of the Japanese Islands in the Pacific (over 180°E between 30° and 40°N in zonal form) were independent of typhoons. The latter sferics are clear in winter, vague in summer and are perhaps due to convergence in the frontal zone in the upper air and at the surface of the earth. *Subject Headings:* **1. Sferics sources 2. Sferics from typhoons 3. Typhoon "Ruth," 1951 4. Typhoon "Kezia," 1950 5. Convergence 6. Jet stream 7. Japan 8. West Pacific Region.**—*W.N.*

**4K–265** 551.501.83:551.594.22(52)

Kimpara, Atsushi, **The waveform of atmospherics in the daytime.** *Nagoya. University. Research Institute of Atmospherics, Proceedings*, 1:1–11, Jan. **1953.** 16 figs., photos, 7 refs. **DWB**—Report on measurement of wave forms of daytime sferics conducted from 1940 to 1944 with cathode-ray oscillographs placed at Iwatsudi Receiving station, Kanto District, Japan and 56 kms from there at Kadeida Magnetic observatory; 8500 observations were recorded. A few details on the equipment used are given. Frequency curves of atmospherics due to lightning discharges between clouds and earth, discharges between and within clouds, and due to reflection from the E-layer are presented and briefly commented on. Wave forms suggest that daylight atmospherics in summer all originate in some kind of electric discharge in the atmosphere. *Subject Headings:* **1. Sferics from lightning 2. Sferics wave forms 3. Lightning properties 4. Sferics reflections from ionosphere 5. Cathode-ray oscillographs 6. Japan.**—*G.T.*

**4K–266** 551.501.83:551.515

*Kitagawa, N.; Iizuka, T.; Murai, K. and Kobayashi, M., **Location of atmospherics and their relation to meteorological phenomena.** *Meteorological Society of Japan, Journal*, 31(2):37–50, Feb. **1953.** 12 figs., 8 tables, 3 refs. In Japanese, English summary p. 37. **MH-BH**—Simultaneous observations of atmospherics were made with cathode-ray direction finders located at three stations several hundred km apart. Errors in determining location of sources are claimed to be less than ±1°, which secures sufficient accuracy within 3000 km. Data on sferics and corresponding atmospheric phenomena are tabulated and shown in charts. Sources of sferics are identified in disturbances due to easterly waves, stationary fronts, young cyclones and typhoons. *Subject Heading:* **1. Sferics location.**—*G.T.*

**4K–267** 551.501.83 551.509.1

Maidens, A. L., **Methods of synchronizing the observations of a "sferics" network.** *Meteorological Magazine*, London, 82(975):267–270, Sept. **1953.** Also as: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zurich, March 17–24, 1953, **Colloque Mondial des Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 23. **DWB**—The method of simultaneous observation of selected sferics at 3 or more stations and passage of results to a control station, is described. This requires a special telephone system; a less costly method using a W/T transmitter is described; also a continuously recording photographic system and a synchronized time-signal method. *Subject Heading:* **1. Sferics networks.**—*C.E.P.B.*

**4K–268** 551.501.81:551.594.221

Miles, V. G., **Radar echoes associated with lightning.** *Journal of Atmospheric and Terrestrial Physics*, 3(5):258–262, June **1953.** 2 figs., table, 3 refs. **MH-BH**—Radar echoes are described from overhead (with photographs) and distant thunderstorms. The echoes from overhead storms showed lightning flashes at base heights of 4 to 9 km, duration 0.14 to 0.47 sec, sometimes in pairs at different heights. They are attributed to sharply defined highly ionized upper end of the discharge channel. Lightning echoes from distant storms last 1/50 sec, are roughly rectangular with steep sides, and extend over a range of about 5 km. *Subject Heading:* **1. Radar echoes from lightning.**—*C.E.P.B.*

**4K–269** 551.501.83:551.594.221

Morrison, R. B., **The variation with distance in the range 0–100 km of atmospheric wave forms.** *Philosophical Magazine*, Ser. 7, 44(356):980–986, Sept. **1953.** 10 figs., 9 refs., 6 eqs. **DWB**—Photographs of wave forms of field changes with lightning flashes distant 16–100 km during passage of a violent thunderstorm across London are given. The 'b' portion (rapid, large increase of electric field) shows a sharp maximum 24 sec after beginning of return stroke, and a minimum after 50–100 sec depending on distance. As distance increased, minimum decreased and became negative above 70 km. A theoretical development of changes is given, taking account of variation of current and increasing height of discharge with time, from which electric field can be calculated. Calculated wave forms at 10–100 km and values of maximum field and net electrostatic change agree well with observations. *Subject Headings:* **1. Sferics wave forms 2. Sferics from lightning.**—*C.E.P.B.*

**4K–270** 551.501.8

Nagoya. University. Research Institute of Atmospherics, **Proceedings.** First issue received Vol. 1, Jan. **1953.** Director of the Institute, and Chairman of the Editorial Committee of the Proceedings, Atsushi Kimpara. Contents of Vol. 1 entirely in English. tables, graphs, photos refs. **DWB**—The first volume of this new series contains 15 original papers on sferics, 11 of which have direct bearing on sferics from cumulo-nimbus, typhoons, lightning and thunderstorms. The remaining papers are concerned with solar noise. The observations were conducted during 1950–1952 in Japan and vicinity and in East Asia. *Subject Headings:* **1. Sferics research 2. Serial publications 3. Japan.**—*M.R.*

**4K–271** 551.501.83 551.508.9

*Norinder, Harald, **Long-distance location of thunderstorms.** (In: **Thunderstorm electricity** Chicago, Univ. of Chicago Press, **1953.** Chap. XIV, p. 276–327. 54 figs., refs.) **DLC**—In this chapter the author reviews the entire history of sferics of thunderstorm location from the discovery of Popov (*see* 4K–1 above) down to 1950; and of instrumentation from the Branly coherer principle used by Popov to the cathode-ray oscillograph used by Watson-Watt and Herd (*see* 4K–54 above) and refined for use in the British Isles, South Africa, Sweden, Australia, etc. in connection with direction finding equipment. Most of the known types of equipment are illustrated. Special emphasis is given to the work done by the author and his colleagues in Sweden. The relation of sferics to air masses and to the earth as a whole is analyzed. *Subject Headings:* **1. History of sferics 2. Sferics equipment 3. Textbooks 4. Sferics thunderstorm location.**—*M.R.*

**4K–272** 551.594.7 551.501.83:551.51

**Program of the Conference on Radio Meteorology, American Meteorological Society—125th National Meeting, November 9–12, 1953, The University of Texas, Austin, Texas.** *American Meteorological Society, Bulletin*, 34(7):321–333, Sept. **1953.** **MH-BH**—In addition to numerous papers on tropospheric propagation, refractive index, atmospheric scattering, cloud and precipitation physics and operational uses of weather radar, there are several papers on thunderstorm and tornado sferics, the abstracts of which are printed in this issue. These papers are entitled: **"Correlation between sferics and tornado incidence"** by H. L. Jones; **"Correlation of thunderstorm atmospheric measurements"** by J. Weil and M. M. Newman,; **"Recording and classification of thunderstorm atmospherics by counter techniques"** by M. M. Newman, Stahmann, J. R. and Anderson, J. R

and **"Atmospheric waveforms and the location of thunderstorms"** by E. T. PIERCE and T. W. WORMELL; **"The lightning discharge propagation mechanism effect on atmospherics waveforms including 'whistlers,'"** by M. M. NEWMAN, and **"Lightning identification on the P.P.I."** by D. M. SWINGLE. The conference was sponsored by the American Meteorological Society, the Institute of Radio Engineers, Professional Group on Antennas and Propagation, the International Scientific Radio Union and the Joint Commission on Radio Meteorology of the International Scientific Unions. The papers will be published in the Proceedings of the Conference on Radio Meteorology. *Subject Headings:* **1. Radio meteorology conferences 2. Radio meteorology 3. Sferics symposia 4. Conference programs.**—*M.R.*

**4K–273** 551.501.83:551.594.6:551.594.221

Schumann, W. O., **Über die Oberwellenfelder bei der Ausbreitung langer elektrischer Wellen um die Erde und die Signale des Blitzes.** [On the overtone field in the distribution of long electric waves and lightning signals.] *Naturwissenschaften*, 40(19):504–505, Oct. **1953.** 5 refs., eqs. **DWB**—From a vertical dipole, including a vertical lightning flash, the spread of a very long wave is treated as radiation in the space between earth's surface and ionosphere. Overtones are important near the transmitter but are damped out at great distances. Resonance only occurs in waves of the lowest frequency available for the earth-ionosphere system. Waves from a horizontal dipole or lightning flash are only important when the source is not more than a quarter of the wave length above the surface. At a small distance they are largely overtones, but at greater distances only ground wave remains. *Subject Heading:* **1. Sferics from lightning.**—*C.E.P.B.*

**4K–274** 551.594.7:621.396:06

Smith-Rose, R. L., **International Scientific Radio Union. Meeting in Sydney.** *Nature*, London, 171(4354):628–631, April 11, **1953. DWB**—Report of meeting Aug. 11–21, 1952. Subjects discussed included Measurements and Standards, Troposphere and wave propagation, Ionosphere and wave propagation, International Geophysical Year 1957–58, Terrestrial atmospherics, and Radio-astronomy. *Subject Headings:* **1. Radio meteorology 2. Radio transmission 3. Sferics 4. Conventions 5. International Scientific Radio Union.**—*C.E.P.B.*

**4K–275** 551.5:06 551.594.7:551.501.83

†World Meteorological Organization. Commission for Aerology. Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques. World symposium on spherics. Acte Final. Final Act.** [Zürich], Station Centrale Suisse de Météorologie, April **1953.** Each section separately paged. In French and English. **DWB**—A great number of informative papers (abstracted separately below) on the use of sferics in forecasting or on instrumental, observational or organizational aspects of sferics stations and networks in the various countries are presented along with the minutes of the meetings, agendas, recommendations, codes, lists of delegates from nine countries attending the meeting in Zürich. A glossary of terms and a bibliography on sferics are among the projects contemplated by resolutions. A world chart shows present location of sferics stations (also listed with coordinates, frequency, type, etc.). A short bibliography of papers on the application of sferics to synoptic meteorology is included. *Subject Headings:* **1. Sferics conferences 2. Sferics symposia 3. Sferics networks 4. Zürich, Switzerland.**—*M.R.*

**4K–276** 551.509.1:551.501.83

§Rieker, J., **Information concernant les recoupements faits à Zurich.** [Note on fixes obtained at Zürich.] (In: WMO. Commission for Aerology. Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 10. charts.) **DWB**—The details of the observation and reporting of sferics as practiced by the Swiss Meteorological Service at Zürich and the method of collecting and plotting storm areas in the Mediterranean or even as far away as North America or the Western Atlantic are given and illustrated by a number of synoptic charts of those areas with sferics bearings and areas of sources associated with fronts. Data are all for night portion of 24 hours at distances 10,000 to 15,000 km. It is desirable that each first order station be equipped to report sferics. *Subject Headings:* **1. Sferics reporting 2. Sferics charting 3. Sferics map analysis 4. Zürich, Switzerland.**—*M.R.*

**4K–277** 551.508.94

**Compteur de décharges orageuses, modèle suisse, en fonction depuis 1953.** [Circuit diagram of the Swiss lightning counter used since 1953.] (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 12. 1 p. diagr.) **DWB**—Wiring diagram—no text. *Subject Headings:* **1. Sferics counters 2. Lightning counters 3. Swiss sferics recorders.**—*M.R.*

**4K–278** **551.501.83:551.509.1**

Bureau, Robert, **Messages "Atmos."** ["Atmos" messages.] (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 14, p. 1.) **DWB**—A narrow sector goniometer is used at Bagneux and Rabat by the French Meteorological Service. Examples of the use of the "atmos" or sferics code to the reporting of data obtained from this equipment are given. These examples comprise: 1) North Atlantic (comprising Brazil), 2) Sudanese, and 3) Southeast (Italy, Balkans and Eastern Mediterranean). The Atlantic sources are usually detected late at night—the Sudanese last many hours and so do those from the Southeast. Two messages a day are suggested: 1) for 0800–1600 and 2) 1600 to 0800. *Subject Headings:* **1. Sferics code messages 2. Sferics sources 3. Bagneux, France 4. Rabat, Morocco.**—*M.R.*

**4K–279** **551.501.83:551.509.5:551.515.4**

Bost, R., **Exemple de radiolocalisation rapide d'un orage à l'aide des goniomètres à secteur étroit.** [Example of rapid storm location by narrow sector goniometer.] (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 14, p. 2–6, table, chart.) **DWB**—Movement of a thunderstorm area on July 31, 1951 was forecast from narrow sector radiolocation data obtained at Bagneux. The reports from the French sferics network and from ordinary meteorological networks were used to verify the "quick" single station forecast. Diagram shows network and successive fixes as the storm moved toward the NE. *Subject Heading:* **1. Thunderstorm forecasting from sferics.**—*M.R.*

**4K–280** **551.509.1:551.501.83**

Pierce, E. T., **Atmospherics. A survey of work at the Cavendish Laboratory.** (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 15. 2 p. **The counting of lightning discharges.** *Ibid.*, Document de Travail, No. 16. 1 p. **The location of spheric stations.** *Ibid.*, Document de Travail, No. 17. 1 p. **Temporal effects in atmospherics.** *Ibid.*, Document de Travail, No. 18. 2 p.) **DWB**—Atmospherics are classified into 9 categories according to wave form as shown on straightforward or on narrow band receivers, and the geographical distribution as well as temporal changes in wave forms studied. Difficulties occur even in counting number of sferics originating within 20 km. If more were known about mechanisms responsible for variations in wave form, single station might replace present methods. Includes an account and several papers summarizing work done in sferics, wave forms and space charges around lightning strokes. *Subject Headings:* **1. Sferics research 2. Sferics wave forms 3. Sferics variations 4. England.**—*M.R.*

**4K–281** **551.509.1:551.501.83**

Israël, Hans and Meinhold, Heinz, **Signification et necessité des recherches sur les parasites atmosphériques. Principes et méthodes de mesure.** [Significance and necessity of atmospherics investigations. Principles and methods of measurement.] (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 19. 10 p. 2 figs.) **DWB**—Various aspects of sferics recording and interpretation are reviewed, instruments and networks described and a comparison of costs of different systems vs. results obtainable made and applications for NW Europe illustrated. Two stations are necessary to determine sources to 180° (NW or SE) and 3 in a triangle to reduce errors to a minimum. *Subject Headings:* **1. Sferics networks 2. Sferics equipment.**—*M.R.*

**4K–282** **551.501.83**

**Memorandum on work being carried out with "sferics" apparatus by the Rhodesian Meteorological Service.** (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 21. 4 p. 2 diagrs.) **DWB**—A cathode-ray direction finder was installed at Bulawayo, S. Rhodesia, in 1937. It demonstrated its usefulness but could not be continued after 1938 due to communication trouble. In June 1948 a ceraunometer was recommended for use as an automatic lightning counter in Rhodesia. The outlines of the circuits of the direction finder and ceraunometer are included in this report. *Subject Headings:* **1. Cathode-ray direction finders 2. Sferics recorders 3. Ceraunometers 4. Bulawayo, Southern Rhodesia.**—*M.R.*

**4K–283** **551.501.83:551.515.4**

Horner, F., **A discussion of certain techniques for locating thunderstorms by radio means.** (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich,

March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document le Travail, No. 22. 3 p.) **DWB**—The U.K. network consists of four cathode-ray direction finding stations 500 km apart operating at 10 Kc/sec and locates storms up to 2000 km with 1° or better accuracy (at 1000 km probable error is 50 to 100 km). Two methods of single station location involve timing between successive pulses reflected from ionosphere—useful for 500 or 1000 mile (distant) sources; and observation of energy received in various high frequency bands—useful mainly for distances <500 km. This requires integration with low frequency direction finders to make accurate forecasts. *Subject Headings:* **1. Sferics research 2. Sferics networks 3. Single station sferics location 4. Great Britain.**—*M.R.*

**4K–284** 551.509.1:551.501.83

Ireland, A. W., **Extract from [his] letter to the President ad. int. of the Working Group on Radio-Electric Meteorology.** (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 24. 1 p.) **DWB**—A network is being established in the Sudan using Khartoum as the control station and 5 satellite stations. Equipment will be of the type used by the British Meteorological Office. *Subject Headings:* **1. Sferics networks 2. British Sudan.**—*M.R.*

**4K–285** 551.509.1:551.501.83

Bidault-de-L'Isle, G., **Observations des parasites atmosphériques au Maroc.** [Observations of atmospheric parasites in Morocco.] (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 25. 1 p.) **DWB**—Statistical records of sferics have been maintained at Rabat since 1930. A narrow sector goniometer was added in 1946. Both instruments operate on 11,000 m wave length. The station is part of the French network with control station at Bagneux. A cathode-ray goniometer was installed at Fédale in 1951 and transferred to Casablanca in 1952 to study the wave forms of sferics in collaboration with the centers of research at Cambridge, England, and at Poitiers, France. *Subject Headings:* **1. Sferics research 2. Sferics networks 3. Rabat, Morocco 4. Fédale, Morocco.**—*M.R.*

**4K–286** 551.501.83

Kimpara, Atsushi, Sao, Kazuo and Oya, Yuichiro, **Note of the Research Institute of Atmospherics, Nagoya University. 1. Waveform of atmospherics at night. 2. The Typhoon Ruth and atmospherics. 3. Atmospherics due to fronts in the upper atmosphere. 4. Atmospherics in winter.** (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 26. 3 p.) **DWB**—Abstracts of 4 papers which were prepared at Nagoya University by the Atmospherics Research Institute (for papers 2 and 3 *see* 4K-264 and 4K–263 above). Previous work had determined the wave form of daytime sferics (*see* 4K–265 above); the current work made it possible to determine types of discharges or of weather from night sferics in addition to fixing the height of the ionosphere, typhoons, upper fronts and winter jet stream. Conditions were also investigated in connection with zonal distribution of sferics. *Subject Headings:* **1. Sferics research 2. Sferics wave forms 3. Nagoya, Japan.**—*M.R.*

**4K–287** 551.501.83

Carbenay, Fernand, **Notes du Laboratoire National de Radioélectricité.** [Notes from the National Radio Electric Laboratory.] (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 30. 10 p. refs., eqs.) **DWB**—A theoretical development of a table allowing one to determine the amount of energy of the impulse received by the antenna for a given wave length (2000, 5000, 11,000 and 25,000 m) and of the distance the impulse is carried from the source (1000 to 3000 km, etc.). *Subject Heading:* **1. Sferics energy.**

**4K–288** 551.501.83:551.515.3

Pick, Lawrence A., **Characteristics of sferics associated with tornadoes.** (In: WMO. Commission for Aerology, Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 31. 3 p.) **DWB**—Sferics associated with thunderstorms are classified into 4 categories according to the ratio between the number of high frequency wave forms and the number of ordinary low frequency wave forms. If the ratio is greater than 1 to 2 it is predicted that tornado or near-tornado situations will exist; as in near-tornado formations in Oklahoma a ratio of 1 to 2 was observed. The rate of occurrence of sferics is also very high in such cases, about 18 to 20 sferics per second being recorded on film at 10 Kc frequency. Improvements in recording equipment to get better

data on rate of frequency are suggested. *Subject Headings:* **1. Tornado forecasting from sferic 2. Short wave sferics 3. Sferics rate 4. Stillwater, Oklahoma.**—*M.R.*

**4K–289** **551.508.94:551.501.8**

Bost, R., **Etalonnement des récepteurs d'atmosphériques en flux d'impulsion.** [Calibratio of sferics recorders according to energy of the impulse.] (In: WMO. Commission for Aerology Working Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial d Parasites Atmosphériques, Acte Final, 1953.** Document de Travail, No. 34. 3 p. 5 refs.) **DWI** —The variation in energy of sferics is as important as the wave length for summary and analysi of the characteristics of sferics activity at any hour, day, month or year. A study of the flux o energy at $\lambda = 11$ km has been undertaken at the National Radioelectric Laboratory (France) an some of the results are described. A first approximation of the law of variation of energy receive as a function of the nature and distance of sources has been made. *Subject Headings:* **1. Sferic energy 2. Sferics recorder calibration.**—*M.R.*

**4K–290** **551.501.83:551.509.**

Bost, R., **Observations concernant la mise en application du nouveau code "Atmos."** [Remark on the application of the new ATMOS code.] (In: WMO. Commission for Aerology, Workin Group on Radio-Electric Meteorology, Zürich, March 17–24, 1953, **Colloque Mondial de Parasite Atmosphériques, Acte Final, 1953.** Document de Travail, No 35. 3 p. 5 refs.) **DWB**—Sug gested changes in sferics code to take into account the density of sferics in any given sector. *Subje Heading:* **1. Sferics codes.**—*M.R.*

**4K–291** **551.501.83:551.509.5**

[Poland. Panstwowy Instytut Hydrologiczno-Meteorologiczny], **Note concernant le problèm des parasites atmosphériques.** [Note concerning the problem of atmospheric parasites.] (In WMO. Commission of Aerology, Working Group on Radio-Electric Meteorology, Zürich, Marc 17–24, 1953, **Colloque Mondial de Parasites Atmosphériques, Acte Final, 1953.** Document d Travail, No. 44. 2 p. 4 diagr.) **DWB**—Comparative curves show the relation between directio of sferics throughout the 24 hours in Jan.–Feb. and March–April and subsequent air temperatur at Jabłonna, Poland. If greatest density is toward the west the weather turns cold 18–72 hou later—if toward the south it will turn warm. Further study is suggested to establish forecas relationships. *Subject Headings:* **1. Sferics direction 2. Temperature forecasting from sferic 3. Jabłonna, Poland.**—*M.R.*

## SUPPLEMENTARY MATERIAL

**4K–292** **551.594.6:551.515.**

*Gherzi, Ernest, **Recherches radiogoniométriques sur la marche des typhons** [and] **Relèvement radiogoniométriques à Changhai.** [Radiogoniometric research on the progress of typhoons. Radi goniometric records at Shanghai.] *L'Onde Électrique*, Paris, (undated issue, about **1925**). 18 figs., tables, refs. Note: Pub. received in U. S. Naval Obs., July 28, 1925. **DWB**—A series studies on the movements of typhoons and atmospheric were made at the Zi-ka-wei Observator from June to Oct. 1923. A distinct decrease of atmospherics was observed before a typhoon cent approached. Results are given in tables. *Subject Headings:* **1. Sferics from typhoons 2. Sferic from typhoon centers 3. Shanghai, China.**—*W.N.*

**4K–293** **551.501.81:551.515.81:551.594.22**

Marshall, John Stewart, **Frontal precipitation and lightning observed by radar.** *Canadia Journal of Physics*, 31(2):194–203, Feb. **1953.** 6 figs., 4 refs. **DLC**—A typical pattern (reveale by radar) of precipitation along a cold front includes both showers containing many nearly vertic cells, and continuous rain characterized by uniformity below the freezing level and the "brigl band" of scanning at angles of elevation up to 30°. At wave length 3 cm, observations of this so reveal some of the snow above the bright band, and its trailing pattern. At 10.7 cm, little is seen the snow, but transient echoes with duration of the order of one second are observed, attributab to lightning. These echoes have not been detected when scanning in the vertical wave length 3. cm, although observers have reported something of the sort at 3.2 cm when different observin techniques were used. The transient echoes occur outside, but close to, regions of rain; mo frequently about one mile from the top of a shower cell. It is probable, combining 3.2 cm observa tions of snow one one occasion with 10.7 cm observation of the transients on another occasion, th the transients occur in the regions not only near rain, but at the same time in or near a region fille with snow. (*Same item as* 4.10–34, Oct. 1953, *MAB.*) *Subject Headings:* **1. Radar storm detectio 2. Sferics on radar 3. Frontal structure 4. Lightning.**—*Author's abstract.*

**4K–294** 551.501.83:406

Thomson, Andrew and Gold, E., **'Sferics' or 'spherics'?** *Weather*, 8(11):353–354, Nov. **1953. IH-BH**—Both argue against the change by the WMO of "sferics" to "spherics" on the grounds hat sferics is an established code word and one letter shorter. *Subject Heading:* **1. Sferics ter-inology.**—*C.E.P.B.*

**4K–295** 551.594.221

Wormell, T. W., **Lightning.** *Royal Meteorological Society, Quarterly Journal*, 79(342):474–489, ct. **1953.** 5 figs., 25 refs. Discussion p. 551–552. **DWB**—The scientific study of lightning egins with FRANKLIN, but first quantitative measurements of charge transmitted by flashes up to 00 km away were made by C. T. R. WILSON with a capillary electrometer. Author next describes etails of discharge processes shown by SCHONLAND with Boys camera, and by PIERCE from varying ectrostatic fields due to flashes distant 30–150 km. The physical processes of lightning as a ant electric spark are described. Finally, forms and propagation of sferics and their use in locating hunderstorms are set out. *Subject Headings:* **1. History of lightning research 2. Sferics thunder-orm detection.**—*C.E.P.B.*

# PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

**Note:** The contents of periodicals included in this section are for information only, and will not be listed in the monthly author or subject indexes. If not abstracted during the year they will be cited in the annual Cumulative Author Index. When material is furnished in advance of date of publication, the pagination may be omitted.

**American Meteorological Society, Bulletin,** Volume 34, Number 7, September 1953.

Laird, Harley B. and Dickey, Woodrow W.: **Forecasting rain-or-snow at Denver, Colorado** p. 287–292.

Amble, O.: **A smoothing technique for pressure maps,** p. 293–297.

Beaumont, R. T.: **Cloud-seeding analysis in Oregon,** p. 298–303.

Ives, Ronald L.; Wilkinson, Rita K. and Kroona, Evelyn L.: **Surface winds in the Salt Lake Desert. I. The Beulah Station record,** p. 304–310.

Carlin, Albert V.: **A case of study of the dispersion of energy in planetary waves,** p. 311–318.

Baum, Werner A.: **Accrediting problems in meteorology,** p. 319–320.

**Program of the Conference on Radio Meteorology, American Meteorological Society—25th National Meeting, November 9–12, 1953, The University of Texas, Austin, Texas,** p. 321–333.

Colón, José A.: **The mean summer atmosphere of the rainy season over the Western Tropical Pacific Ocean,** p. 333–334.

Number 8, October 1953.

Lederer, Jerome: **Relationships between weather and air safety,** p. 339–350.

Neiburger, Morris: **The place of synoptic meteorology in the university curriculum,** p. 351–354.

Dingle, A. N.: **Meteorology in the State Universities,** p. 355–356.

Gordon, A. H.: **Seasonal changes in the mean pressure distribution over the world and some inferences about the general circulation,** p. 357–367.

Oliver, Vincent, Jr. and Oliver, Mildred B.: **A method of applying tilted trough theory to synoptic forecasting in the mid-troposphere,** p. 367–375.

**Annales de Géophysique,** Paris, Volume 9, Number 3, July/September 1953.

Queney, P.: **Phénomènes de résonance et d'instabilité dans les écoulements barotropes, avec application aux ondes atmosphériques de grande échelle,** [Resonance and instability phenomena in barotropic fluids with application to large scale atmospheric waves], p. 185–226.

Argence, E.: **Action du champ magnétique terrestre sur la propagation des ondes courtes: application au calcul de la "fréquence maximum utilisable,"** [Action of the terrestrial magnetic field on the propagation of short waves, application to the calculation of the "maximum usable frequency"], p. 227–244.

Ewing, Maurice and Press, Frank: **Mechanisms of T wave propagation,** p. 248–249.

Jobert, G. and Jobert, N.: **Application du principe de Rayleigh à la dispersion d'ondes superficielles,** [Application of the Rayleigh principle to the dispersion of superficial waves] p. 250–255.

Mayayd, Pierre-Noël: **Enregistrement du champ magnétique terrestre à Port-Martin,** [Recording of terrestrial magnetic field at Port-Martin], p. 256–265.

Mayaud, Pierre-Noël: **Le pole magnétique Sud en 1952 et les déplacements comparés des poles Nord et Sud de 1842 à 1952,** [The magnetic South Pole in 1952 and the displacement of the North Pole compared with those of the South Pole from 1842 to 1952], p. 266–27

Tabuteau, François: **Travaux séismologiques de la première expédition en Terre Adélie (1950). Installation et fonctionnement,** [Seismological work done by the first expedition to Adél Land (1950). Installation and functioning], p. 277–278.

Beaufils, Y.: **Travaux séismologiques de la première expedition en Terre Adélie (1950). Bulletin séismique de "Terre Adélie,"** [Seismological work done by the first expedition Adélie Land (1950). Seismological bulletin of Adélie Land], p. 278–279.

Bernard, Pierre: **Travaux séismologiques de la première expedition en Terre Adélie (1950). Recherche de l'origine des microséismes enregistrés à Port-Martin,** [Seismological work done by the 1st expedition to Adélie Land (1950). Research on the origin of microseisms recorded at Port-Martin], p. 280–283.

**chiv für Meteorologie, Geophysik und Bioklimatologie, Serie B,** Volume 5, Number 1, 1953.

Möller, F.: **Über die Farbe der Sicht und des Tageshimmels,** [On color of visibility and the color of the sky by day], p. 1–17.

Drimmel, Julius: **Über theoretische Formeln zur Berechnung der nächtlichen Abkühlung der Erdoberfläche und über ihre Anwendungsmöglichkeiten,** [On theoretical formulas for calculating nocturnal cooling of the earth's surface and their application], p. 18–40.

Howell, Wallace E.: **Local weather of the Chicama Valley (Peru),** p. 41–51.

Schilling, Gerhard F. and Carson, Joan: **On the electrical conductivity of air inside buildings, (Publication No. 25 of the Institute of Geophysics, University of California at Los Angeles),** p. 52–58.

Diem, M.: **Feuchtemessung mit Hilfe thermoelektrischer Psychrometer,** [Humidity measurements with the help of the thermoelectric psychrometer], p. 59–65.

Berger-Landefeldt, U.: **Beiträge zur Messung der Evapotranspiration nach dem Austauschverfahren,** [Contributions to the measurement of evapotranspiration by the exchange method], p. 66–102.

Reissmann, Kurt R.; Buettner, Konrad and Topka, Elaine, A.: **Influence of solar activity, especially at high altitudes, on the TAKATA-flocculation-reaction in serum of normal persons,** p. 103–111.

Reiter, Reinhold: **Schmerzempfindung und Wetter,** [Pain sensitivity and weather], **Ein Nachtrag zur Arbeit,** [Supplement to the work of K. Brunnhölzl, F. Schiedel and H. Ungeheuer], p. 112–113.

**chiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B,** Volume 6, Number 1, 1953.

Mason, B. J.: **Progress in cloud physics research. A progress report on recent investigations at Imperial College, London,** p. 1–52.

Arakawa, H.: **Baroclinity along some meridional cross sections through the atmosphere,** p. 53–58.

Neuwirth, R.: **Feuchtegehalt der Atmosphäre und Niedershlagsprognose im Zusammenhang mit der Lage des Beobachtungsortes zum planetarischen Ringstrom (Jet Stream),** [Moisture content of the atmosphere and precipitation forecasts in connection with the position of the observation place relative to the planetary ring current (jet stream)], p. 59–77.

Conrad, V.: **The components of the diurnal variation of temperature on Mt. Washington and other summits,** p. 78–107.

Hoinkes, H.: **Beobachtung einer Untersonne,** [Observation of an inferior parhelion], p. 108–110.

Israël, H. and Toperczer, N.: **Hans Benndorf,** p. 111–113.

**eophysical Magazine,** Tokyo, Volume 24, Number 4, March 1953.

Yoshitake, M.: **On the dynamics of open systems and its application to the motion of typhoons,** p. 193–207.

Sakuraba, S.: **The relation between a closed energy system and an open energy system,** p. 209–218.

Sakuraba, S.: **A note on the energy transformation in a tropical cyclone,** p. 219–221.

Kawabata, Y.: **On the intensity of nocturnal radiation in various parts of Asia,** p. 223–229.

**öjárás,** Budapest, Volume 56, Number 11/12, November/December 1952.

Kéri, Menyhért: **Nemzetközi meteorológiai és hidrológiai kongresszus Magyarországon 1952. november 26–29-én,** [International meteorological and hydrological conference in Hungary on Nov. 26–29, 1952], p. 331–332.

Konček, Mikuláš: **Zúzmaramérések a Lomnici csúcson és egy új műszer a zúzmaralerakódások önmüködö regisztrálására,** [Rime measurements on Lomnic Peak, and a new instrument for automatic recording of rime deposits], p. 333–337.

Kérdö, István: **Összefüggések az asthmás rohamok és a levegöfajták között,** [Correlation between attacks of asthma and air-mass types], p. 338–346.

Péczely, György: **Csapadékhullámok vándorlása Európában,** [Propagation of precipitation waves across Europe], p. 347–352.

Erdélyszky, Zsigmond: **Tetens empírikus képletének elméleti levezetése,** [Theoretical derivation of Tetens' empirical formula], p. 353–356.

Vitkevich, V. J.: **Új készülékek a talajmenti levegőréteg kutatására,** [New instruments fo investigating the atmospheric layer near the ground], p. 356–362.
Tardos, Béla: **A magaslégköri hullámszél jelenségek kutatásának mai állása elméleti és gya korlati vonatkozásban,** [Present state of theoretical and practical research on planetar waves], p. 362.
Bartha, Lajos and Piret, Endre: **Adatok a Nap felületi jelenségeinek és a rádió-fadingok ösz szefüggésének vizsgálatához,** [Data on the correlation between solar activity and radi fadeout], p. 363–373.
Flórián, Endre: **A nyomásképi repülés,** [Pressure flying], p. 373.
**[Data and descriptive accounts of weather, fronts, air masses, and solar activity for Hungary Nov.–Dec., 1952],** p. 374–381.
Dózsa, László: **Egy szürkületi fényjelenség érdekességei,** [An interesting twilight phenom enon], p. 382–385, p. 391–394.

## Volume 57, Number 2, March/April, 1953.

Berényi, Dénes: **Az időjárás és a mezögazdasági termelés a mai tudomány tükrében,** [Weathe and farm production as reflected in modern science], p. 65–80.
Szilágyi, Tibor: **A mezövédö erdösávok csapadéknövelö hatásának kérdéséröl,** [On the prob lem of increasing precipitation by means of shelter belts], p. 81–89.
Mátyus, József Sz.: **Magyarország éghajlatának fülledtségi viszonyairól,** [Sultriness condition in Hungary's climate], p. 90–97.
Somfai, János: **Érdekes halo-jelenség Bakonybélen,** [Interesting halo phenomenon in Ba konybél], p. 97.
Péczely, György: **Hózápor menydörgéssel Hódmezövásárhelyen, 1953. március 12. -én** [Snow shower with thunder at Hódmezövásárhely on March 12, 1953], p. 97.
Péczely, György: **A tél és a nyár időjárási típusaiban mutatkozó szakaszosságok,** [Periodicitie of weather types in winter and summer], p. 98–102.
Takács, Lajos and Zsolnai, János: **Érzékeny csapadéknyomjelzö,** [A sensitive raindrop re corder], p. 103–108.
Glakhov, V. V.: **Téli zivatarok a szárazföldön,** [Continental winter thunderstorms], p. 108–112
Körösi, György: **Újítási feladataink,** [New developments of the Hungarian Meteorologica Institute], p. 112–114.
**[Data and descriptive account of weather, fronts, air masses and solar activity for Hungary March–April 1953],** p. 115–121.
Gelléri, Sándor [transl.]: **Különösen erös északi fény,** [Particularly intense aurora], p. 126–127

## Volume 57, Number 3, May/June 1953.

Ozorai, Zoltán: **Nem-adiabatikus gradiensü légoszlop szétterülése,** [Spreading of a column o air having a non-adiabatic gradient], p. 129–133.
Kallós, Imréné: **A hömérséklet napi ingadozása különbözö nagyságú felhözet esetén,** [Inter diurnal temperature variations connected with different amounts of cloud cover], p. 134 136.
Kiss, István: **A növényi mikroszervezetek idöérzékenysége,** [Weather sensitivity of plan microorganisms], p. 137–144.
Egerszegi, Sándor: **Az aljtrágyázás rendszerének agrometeorológiai vonatkozásai,** [Agro meteorological aspects of subsoil fertilizing], p. 145–159.
Piret, Endre: **Meteorok és a rádiövétel,** [Meteors and radio reception], p. 159.
Dózsa, László: **A megvilágítási helyzet, mint az összetett idökép egyik adaléka,** [Illumination as an adjunct to the composite weather pattern], p. 160–163.
**A Meteorológiai Társaság 1953. évi közgyülése,** [1953 meeting of the Hungarian Meteorologica Society], p. 164–174.
**Az elmult időjárás,** [Weather in Hungary, May–June 1953], p. 174–181.
**[Reviews],** p. 182–186.
Máthé, Kálmán: **Ezerszinü Balaton,** [Multicolor Balaton], p. 187–190.
Kakas, József: **Felhötölcsér Polgár és Dunaföldvár határában,** [Funnel cloud near Polgár and Dunaföldvár], p. 190–191.
Hajósy, F. and Körösi, Gy.: **Pusztít az időjárás,** [Weather disasters], p. 191.
Piret, Endre: **Meteoranyag a légkör porában,** [Meteoric matter in atmospheric dust], p. 191.
Ozorai, Zoltán: **Leszálló légmozgás zivatar után,** [Downward flow of air after a thunderstorm], p. 191–192.
**B., Z.: Az éjszakai égbolt fénye,** [Light of the night sky], p. 192.

**dian Journal of Meteorology and Geophysics,** Delhi, Volume 4, Number 3, July 1953.

Krishna Rao, P. R. and Ganesan, V.: **Characteristics of the upper troposphere, tropopause and the lower stratosphere over Trivandrum,** p. 193–204.
Parthasarathy, S. and Narayanan, J.: **The diurnal variation of upper winds over the Indian sub-continent,** p. 205–219.
Jagannathan, P.: **Winds at Tiruchirapalli airfield and neighbourhood,** p. 220–235.
Poornachandra Rao, C. and Rama Sastry, A. A.: **Meridional eddy flux of energy in the atmosphere,** p. 236–242.
Ramakrishnan, K. P.: **The stronger squalls of Poona,** p. 243–248.
Bakthavathsalu, C. M. and Balasubramaniyan, C.: **Confidence limits of expected monthly rainfall for the Agricultural College and Research Institute, Coimbatore,** p. 249–252.
Jayarajan, A. P.: **Performance of the fan in the F-type radiosonde in some sharp temperature changes in the atmosphere,** p. 260–261.
Raman, P. K.: **Radiation from overcast skies during night,** p. 261–262.
Srinivasan, V.: **Variation of cyclonic circulation with height in September 1951 deep depression,** p. 263–264.
Chelam, E. V.: **Synoptic aspects of the monsoon circulation and rainfall over Indo-Pakistan,** p. 264–265.

**pan. Central Meteorological Observatory, Tokyo, Memoirs of Industrial Meteorology,** Volume 14, Number 1, July 1950.

Kita, I.: **On diurnal variation of air temperature at the islands in the SETOUCHI (Inland-sea),** p. 1–3.
Hiroshima Local Meteorological Observatory: **Local temperature distribution in citrus orchard on islands,** p. 4–6.
Imada, K.: **Relation between salterns and weather conditions in Naruto, NE Shikoku,** p. 7–10.
Hasegawa, Y. and Yoshioka, S.: **Climatic conditions in the tunnel as a rice ware-house,** p. 11–17.
Watanabe, M.: **Meteorological studies on paddy borer,** p. 18–22.
Tsujimoto, M.: **Relation between rice leafhopper and meteorological conditions in Nara Prefecture,** p. 23–26.
Toyooka Weather Station: **Relation between fisheries and climate on the Japan Sea, Part 1,** p. 27–30.
Ibid.: **Relation between fisheries and climate on the Japan Sea, Part 2. Squid fishing and weather,** p. 31–36.
Tawara, J.: **High-tide around the Shikoku Island by Typhoon Libby, 1948,** p. 37–43.
Hashimoto, Y.: **Relation between high-tide inundation and weather in recent years on the Osaka Bay Coast,** p. 44–53.
Nakatani, K.: **Weather conditions of off-navigation days on the Awaji Line,** p. 54–59.
Oota, M.: **Weather condition of off-navigation days on the Inland Sea Line, Part 1. Off-navigation from strong winds,** p. 60–67.
Oota, M.: **Weather conditions of off-navigation days on the Inland Sea Line, Part 2. Off-navigation from dense fog, etc.,** p. 68–73.
Onishi, K.: **Summary report of subsidence in western Osaka,** p. 74–86.
Yoshino, I. and Mita, N.: **Meteorological disaster on railroad in the Chugoku District,** p. 95–112.

Number 2, October 1950.

Arai, T.: **Warm winter and wheat- and barley-harvest,** p. 1–8.
Takada, G.; Yasui, S.; Shibata, S. and Naito, W.: **On the dry wind damage (white head) of paddy rice by typhoon Ione,** p. 9–18.
Noro, T.: **Hail damage in last decade of May, 1948, in Japan,** p. 19–28.
Hakoda, H.: **Rice yield of harvest experiment,** p. 29–34.
Miyoshi, Y.: **Weather and red mould of wheat,** p. 35–39.
Miyoshi, Y.: **Meteorological studies on harvest experiment,** p. 30–43.
Miyoshi, Y.: **Weather and wheat growth,** p. 44–48.
Shibata, S.: **On evaporation from the soil surface,** p. 49–50.
Shibata, S.: **Soil temperature measurements in a simple framework,** p. 51–55.
Shibata, S.: **Soil temperature distribution in L-shaped furrow which runs from east to west and deformation of furrow shape by frost pillar,** p. 56–58.
Shibata, S.: **On moisture content in the soil,** p. 59–60.
Kubo, J.: **Meteorological studies of sieve silk industry,** p. 61–68.
Noro, T.: **Climate of the Tohoku District, Part 5,** p. 69–80.
Okanoue, M.: **Abnormal high temperature at Fukuoka,** p. 81–92.

Number 3, December 1950.

Arai, T. and Araki, K.: **A survey on the hail storm of September 22, 1945,** p. 1–3.
Uasui, S.: **Damage to crops caused by the hail storm in Owashi District, Aichi Prefecture,** p. 4–7
Kusakabe, M. and Yamamoto, Y.: **Protection of potato from frost by soiling,** p. 8–10.
Saito, N.: **On the dust raised by wind,** p. 11–15.
Kusakabe, M.; Yamamoto, Y. and Okuda, Y.: **Studies on climatic soil in Japan, Part 2, On th Shostakovitch's coefficient,** p. 16–19.
Yamanaka, K.: **Study on moisture content in the natural soil,** p. 20–35.
Osawa, S.: **Meteorology in a coppice,** p. 36–38.
Hayami, K.: **Meteorological studies on Asiatic rice borer,** p. 39–42.
Suzuki, Y. and Onishi, N.: **Budding of tea and weather,** p. 43–44.
Takasuna, M.: **Observations on flowering and falling dates of flowering cherry in Owad Saitama Prefecture,** p. 45–48.
Shinohara, H.: **22 year's period appearing in tree rings of Japanese cedar,** p. 49.
Kubo, J.: **Atmospheric condition in factories,** p. 50–57.
Maruyama, E.: **Simple observation method of wind and the results obtained,** p. 58–59.
Kusakabe, M.: **Bibliography on moisture contents in soil,** p. 60–63.

**Journal of Agricultural Meteorology,** Tokyo, Volume 8, Number 12, March 1953.

Sato, S.: **Average temperature of soil-strata in the paddy field, and its effects on rice-crop,** p 1–3.
Uehara, M. and Isozaki, Y.: **On the micrometeorology in the hot-cap.** (1), p. 4–6.
Tsuboi, Y. and Honda, I.: **Some characteristics of temperature distribution in the paddy fiel being continuously irrigated with cold water,** p. 7–11.
Kashiwapaki, K.: **The aspect of frozen paddy field in the district around the city of Utsunomiy** (1), p. 12–13.
Nishiuchi, H.: **On the index of temperature climate at the limit of water rice crop culture in th world,** p. 14–16.
Chayamichi, H.: **On the relationships between the Indian black tea plant and the climati elements** (2), p. 17–18.
Kimura, Y.: **On the deviation of wind temperature classified in the four directions at 10 o'cloc daily during the summer season of Aomori Pref. in 1949,** p. 19–22.
Shinohara, H.: **On the temperature influencing the first flowering-date of the cherry in Korea** p. 23–24.
Usame, T.; Nose, T. and Ichikawa, M.: **Local-climatological research for agriculture** (2) **Domain of influence of a weather station,** p. 25–28.
Yoshida, S. and Sato, Y.: **On the insolation from the whole sky measured under apple trees** p. 29–30.
Yokota, R.: **The rate of the amount of rain falling to the roots under the stems and leaves c crops,** p. 31–32.
Yoshino, M. and Fusuki, K.: **Air temperature at southern and northern valley sides. Com parison of the diurnal change of the air temperature in the small area** (3), p. 33–36.
Inoue, E.; Tani, N. and Imai, K.: **Some measurements of wind over cultivated field** (2), p. 45–48
Matsuno, M.; Nishina, N.; Yamanaka, K. and Kubo, J.: **Determine of the distribution of th amount of precipitation taking into consideration the height,** p. 45–51.
Matsubara, S. and Nakato, T.: **Report of the microclimatic observations on high mountains** p. 52–54.
Tanaka, S. and Tanizawa, T.: **Studies on the wind in front and back of the shelter-hedges,** (1 p. 61–63.

**Journal of Atmospheric and Terrestrial Physics,** Volume 3, Number 6, July 1953.

Best, A. C.: **The relation between rain current and rate of rainfall,** p. 285–288.
Scott, James C. W.: **The distribution of $F_2$ region ionization at high latitudes,** p. 289–294.
Dawton, D. I. and Elliot, H.: **Time variations of the soft component of the cosmic radiation** p. 295–300.
Chappell, D. W. G.; Hainsworth, L. B. and Moorat, I. M.: **Some statistical results on th phenomena associated with ionospheric storms,** p. 301–320.
Gardner, F. F. and Pawsey, J. L.: **Study of the ionospheric D-region using partial reflections** p. 321–344.
Chalmers, J. Alan: **The charge on the ionosphere,** p. 345–346.
Chalmers, J. Alan: **The effective separation of discharging points,** p. 346–347.
Hardwick, B.: **Two cases of large $F_2$ region disturbance associated with small magnetic dis turbance,** p. 347–349.

**urnal of Meteorology,** Volume 10, Number 4, August 1953.

Kuo, H. L.: **The stability properties and structure of disturbances in a baroclinic atmosphere,** p. 235–243.
Mitchell, J. Murray: **On the causes of instrumentally observed secular temperature trends,** p. 244–261.
Gleeson, Thomas A.: **Effects of various factors on valley winds,** p. 262–269.
Howell, Wallace E.: **A study of the rainfall of central Cuba,** p. 270–278.
Gunn, Ross and Devin, Charles, Jr.: **Raindrop charge and electric field in active thunderstorms,** p. 279–284.
Wexler, Raymond: **Radar echoes from a growing thunderstorm,** p. 285–290.
Atlas, David and Plank, Vernon G.: **Drop-size history during a shower,** p. 291–295.
Reed, Richard J.: **Large-scale eddy flux as a mechanism for vertical transport of ozone,** p. 296–297.
Abdullah, Abdul J.: **A proposed mechanism of squall lines: the pressure jump line. Reply by Morris Tepper,** p. 298–300.
Ramage, C. S.: **The distribution of rain in tropical storms. Reply by Lawrence A. Hughes,** p. 300–302.
Wexler, Harry: **Direct solar influences on the atmosphere. Reply by C. E. Palmer,** p. 302–306.
Kaplan, Lewis D.: **The impulsive generation of certain changes in the tropospheric circulation. Reply by C. E. Palmer,** p. 306–307.
Fisher, Edwin L.: **Comments on "The impulsive genetarion of certain changes in the tropospheric circulation." Reply by C. E. Palmer,** p. 307–309.

Number 5, October 1953.

Battan, Louis J.: **Observations on the formation and spread of precipitation in convective clouds,** p. 311–324.
MacCready, Paul B., Jr.: **Atmospheric turbulence measurements and analysis,** p. 325–337.
Reed, Richard J. and Sanders, Frederick: **An investigation of the development of a midtropospheric frontal zone and its associated vorticity field,** p. 338–349.
Shapiro, Ralph: **A planetary-atmospheric response to solar activity,** p. 350–355.
Carlstead, Edward M.: **A study of constant absolute vorticity trajectories on isentropic surfaces,** p. 356–361.
Woodcock, A. H.: **Salt nuclei in marine air as a function of altitude and wind force,** p. 362–371.
Friedman, Don G.: **The height variation of lateral gustiness and its effect on lateral diffusion** p. 372–379.
Crary, A.: **Annual variations of upper air winds and temperatures in Alaska from acoustical measurements,** p. 380–389.
Whipple, Fred L.: **Winds in the upper atmosphere by meteor-train photography,** p. 390–392.
Arakawa, H.: **On the time rate of work done by the eddy stresses in the free air, and the maintenance of the westerlies in middle latitudes,** p. 392–393.
James, R. W.: **The earth's angular momentum balance: A nonsense problem?** p. 393–397.
Grant, Alison M.: **The effect of the steady-state assumption on constant vorticity trajectories,** p. 397–398.
Sherman, Leon: **Estimates of the vertical velocity based on the vorticity equation,** p. 399–400.
Neiburger, Morris: **Visibility and liquid content in cloud. Reply by H. J. aufm Kampe and H. K. Weickmann,** p. 401–404.
Simpson, R. H.: **Comments on "The impulsive generation of certain changes in the tropospheric circulation." Reply by, C. E. Palmer,** p. 404–406.

**urnal Scientifique de la Météorologie,** Paris, Number 17, January/March 1953.

Genève, R.; Jacquemard, G. and Piat, D.: **Les hautes pressions permanentes de l'Atlantique Nord,** [Permanent highs of the North Atlantic].
Soudain, Y.: **Analyse polarographique de l'eau de pluie: dosage du calcium,** [Polarograph analysis of rain water: calcium content].
Kiveliovitch, M. and Vialar, J.: **Étude statistique des séries chronologiques,** [Statistical analysis of chronological series].

**arine Observer,** Volume 23, Number 162, October 1953.

**Farewell message from the director,** p. 190.
**Retirement of Sir Nelson K. Johnson,** p. 191.
**New director of the Meteorological Office,** p. 192.

**Retirement of Dr. A. H. R. Goldie,** p. 192.
Drake, Geoffrey: **Loss of H.M.S. *Conway*,** p. 213.
Hay R. F. M.: **Frost smoke and unusually low air temperature at ocean weather station,** p. 218.

**Meteorological Magazine,** London, Volume 82, Number 975, September 1953.

Sawyer, J. S.: **Effect of atmospheric inhomogeneity on the interpretation of vertical temperature soundings,** p. 257–263.
Gloyne, R. W.: **Radiation minimum temperature over a grass surface and over a bare-soil surface,** p. 263–267.
Maidens, A. L.: **Methods of synchronizing the observations of a "sferics" network,** p. 267–270.
Howe, G. Melvyn: **Observations on local climatic conditions in the Aberystwyth area,** p. 270–274.
Bullard, E. C.: **Utilization of solar energy. Institution of Electrical Engineers,** p. 276–277.
Richardson, W. E.: **Four simultaneous concentric halos,** p. 277–279.
Hurst, G. W. and Caton, P. G. F.: **Smoke haze observed from an aircraft,** p. 281–282.

Number 976, October 1953.

**Director of the Meteorological Office,** p. 289.
Sumner, E. J.: **Cold pools: a statistical and synoptic study,** p. 291,
Lewis, R. P. Waldo and McIntosh, D. H.: **Recurrence tendencies in Kew surface pressure,** p. 301.
McConalogue, D. J.: **On the distribution of rainfall rates at some coastal stations in the British Isles,** p. 304.
Ludlam, F. H.: **The rate of rise of pilot balloons,** p. 306.
Ashmore, S. E.: **Gale of December 17, 1952,** p. 313.
Smith, L. P.: **Wind damage to trees,** p. 315.

*Reviews:*
Bull, G. A.: **Sparks, B. W.: Effects of weather on the determination of heights by aneroid barometer in Great Britain,** p. 315.
Bull, G. A.: **Ludlam, F. H.: Present-day forecasting practice,** p. 316.
Bull, G. A.: **Scorer, R. S.: Watching the sky,** p. 316.
Bull, G. A.: **Geographical Journal. Vol. CXIX. Part 2, June 1953,** p. 316.

Number 977, November 1953.

**Dr. O. G. Sutton,** p. 321.
Ward, A.: **Wind direction at North Front, Gibraltar,** p. 322.
Bushby, F. H. and Hinds, N. K.: **Electronic computation of the field of atmospheric development,** p. 330
Cleaver, W. W. and Ratcliffe, R. A. S.: **Fog investigation at Wellesbourne Mountford,** p. 335.
Palmer, W. G.: **Heavy storm at Changi,** p. 341.
Day, G. J.: **Unusually vigorous cumulonimbus cloud over southern England,** p. 342.
**Thunderstorms of June 26, 1953,** p. 344.
Knighting, E.: **Bachelor, G. K.: The theory of homogeneous turbulence,** p. 347.

**La Météorologie,** Paris, 4th Ser., Number 28, October/December 1952.

Serra, L.: **Météorologie et crues,** [Meteorology and floods], p. 141–155.
Condet, J.: **Les avalanches du 19 au 23 janvier 1951,** [Avalanches of Jan. 19 to 23, 1951], p. 156–160.
Deguillaume, M.: **Filets atmosphériques ascendants ou descendants,** [Downward and upward currents of air], p. 161–163.
Baratoux, M.: **Sur une observation de "foudre en boule" faite en avion,** [Observation of a ball lightning from an airplane], p. 164–166.
Bochet, R.: **Le grand groupe de taches solaires du 9 au 22 mai 1951 et le temps correspondant en diverses régions,** [The large group of sunspots of May 9 to 22, 1951 and accompanying weather in different regions], p. 167–168.
Dallant, M.: **Les causes météorologiques de la catastrophe de Menton,** [Meteorological causes of the catastrophe in Menton], p. 169–171.
Gouache, R.: **L'été sec et chaud de 1952 à Ganges (Hérault),** [Dry and hot summer of 1952 in the Ganges (Hérault)], p. 172–174.

Number 29, January/March 1953.

Sourdillon, M.: **Note sur les "familles d'éclairs,"** [Note on multiple lightning strokes], p. 1–3.
Bontrond, E. A.: **Quelques indications pratiques concernant la prévision des températures extrèmes sous abri,** [Practical suggestions for the forecasting of extreme temperatures in shelters], p. 4–15.
Sanson-Carette, A.: **Analyse statistique des séries d'observations pluviométriques,** [Statistical analysis of series of rainfall observations], p. 16–37.
Clausse, R. and Grisollet, H.: **La recherche en météoropathologie,** [Methods of medical meteorology], p. 38–42.
Sanson, J.: **Chaleur et sécheresse ont constitué les dominantes de l'été météorologique 1952** [Heat and drought: the ruling factors of the 1952 summer season], p. 43–49.
Bassy, E.: **L'année géophysique internationale 1957–1958,** [The international geophysical year 1957–1958], p. 50–60.
Ruby, F.: **Les nouvelles méthodes de défense contre la grêle,** [New methods of hail prevention], p. 61–72.
Seltzer, P.: **Un essai: la carte des pluies annuelles probables en Algérie,** [Tentative chart of annual probable rainfall in Algeria], p. 73–75.
Burban, A. and Mironovitch, V.: **Durée d'insolation à Saint-Hilaire-du-Touvet et à Font-Romeu,** [Duration of sunshine at Saint-Hilaire-du-Touvet and at Font-Romeu], p. 76–79.
Bouchet, R.: **Une averse de pluie melée de glaçons et accompagnée de tourbillons d'axe vertical violents le 20 octobre 1952, à la Pointe-Pescade (Alger),** [Torrential rain mixed with sleet and accompanied by violent vertical eddies, on October 20, 1952], p. 80–81.

**Meteorologische Rundschau,** Frankfurt, Volume 6, Number 5/6, May/June 1953.

Stümke, H.: **Quasigeostrophische Darstellung von Konvektionsvorgängen in einer Atmosphäre mit Sperrflächen oder mit freier Oberfläche,** [Quasigeostrophic evaluation of convection processes in an atmosphere with blocking surfaces or with a free upper surface], p. 81–82.
Faust, Heinrich: **Untersuchungen über Vorhersagekarte und Vorhersage,** [Investigations on forecasting charts and forecasts], p. 82–85.
Grunow, J.: **Niederschlagsmessungen am Hang,** [Precipitation measurements on a slope], p. 85–91.
Kreutz, W.: **Einfluss eines Windschutzobjektes in Schwetzingen auf Wind und Niederschlag während eines Jahres,** [Influence of a wind shelter in Schwetzingen (Baden) on wind and precipitation through a year], p. 91–94.
Gressel, W.: **Über das Auftreten von Schneerollen und Schneewalzen in Niederösterreich,** [On the occurrence of snow rollers and snow cylinders in Lower Austria], p. 94–96.
Mollwo, Hans: **Dampfdruck und Gewitter,** [Vapor pressure and thunderstorm], p. 96–98.
Lettau, Heinz: **Über die Ermittlung der Temperaturleitfähigkeit des Untergrundes mittels harmonischer Analyse von Bodentemperatur-Variationen,** [On the calculation of the thermal conductivity of the soil by harmonic analysis of soil temperature variations], p. 99.
aufm Kampe, Hans-J.: **Neuere Stratosphärendaten,** [New stratosphere data], p. 99–100.

**Monthly Weather Review,** Volume 81, Number 6, June 1953.

Day, Stanley: **Horizontal convergence and the occurrence of summer precipitation at Miami, Florida,** p. 155–161.
Myers, Vance A.: **Frequency variation of snow depths in the Missouri and upper Mississippi Basins,** p. 162.
Winston, Jay S.: **The weather and circulation of June 1953. The second successive June with record-breaking drought and heat,** p. 163–168.
Holzworth, George C. and Thomas, Charles F.: **Low level warm air advection, June 8–9, 1953,** p. 169–178.

Number 7, July 1953.

Gifford, Frank, Jr.: **A study of low level air trajectories at Oak Ridge, Tenn.,** p. 179–192.
Harris, Miles F.: **Normal monthly change in sea level pressure and in the gradient of effective solar radiation,** p. 193–194.
Lott, George A.: **The unparalleled thrall, Texas rainstorm,** p. 195–203.
Hawkins, Harry F., Jr.: **The weather and circulation of July 1953,** p. 204–209.
Brown, H. E. and Thomas, C. F.: **Rainfall in maritime tropical air over the Midwest, July 16–18, 1953,** p. 209–216.

**Oceanographical Magazine,** Tokyo, Volume 4, Number 3, December 1952.

Hanzawa, M.: **On some examples of abrupt change of oceanographical conditions at the Ocea Weather Station "Extra" adjacent to the oceanic polar front,** p. 67–79.
Ichiye, T.: **On the variation of oceanographical elements due to the tidal currents,** p. 81–88.
Ichiye, Takashi: **A short note on energy transfer from wind to waves and currents,** p. 89–93.
Miyake, Yasuo: **A table of the saturated vapour pressure of sea water,** p. 95–118.

Number 4, March 1953.

Unoki, Sanae and Nakano, Masito: **On the Cauchy-Poisson waves caused by the eruption of submarine volcano (1st paper),** p. 119–141.
Hanzawa, Masao: **On the eddy diffusion of pumices ejected from Myojin-Reef in the Souther Sea of Japan,** p. 143–148.
Miyazaki, Masamori: **Tidal variations of oceanographical elements,** p. 149–159.
Ichiye, Takashi: **Some remarks on the non-linear theory of shallow water on a sloping beach** p. 159–166.

**Poland. Przegląd Geograficzny,** Volume 24, Number 3, 1952.

Gumiński, Romuald: **Materiały do posnania generzy i struktury klimatu Polski,** [Origin an structure of Poland's climate], p. 3–26.
Okołowicz, Wincenty: **Klimatologia jako nauka i jej stosunek do meteorologii i geograf fizycznej,** [Climatology as a science and its relation to meteorology and geography] p. 27–48.
Kondracki, Jerzy: **Obserwacje nad termika jeziora Niegocin na stacji naukowej Polskieg towarzystwa geograficznego w gizycku (1949–1951),** [Observations on thermal condition of the Lake Niegocin (1949–1951)], p. 49–71.
Kaczorowska, Zofia: **Chubukov, L. A.: Kompleksnaja klimatologia,** [Chubukov, L. A.—Com plex climatology], p. 77–80.

**Polarforschung,** Holzminden, Volume 3, Number 2, June 30, 1951.

Holzapfel, Rupert: **Deutsche Polarforshung 1940–45,** [German polar research, 1940/45] p. 96–97.
Abs, O.: **Aus der Polarmedizin,** [Polar medicine], p. 97–106.
Bauer, Albert: **Französische Plarexpeditionen in Grönland 1948/51 und Adelieland 1948/52** [French Polar expeditions to Greenland, 1948/51 and to Adélie Land, 1948/52], p. 113–115
Ritscher, Alfred: **Deutsche Schwabenland-Expedition 1938/39,** [German Schwaben-Expedition 1938/39], p. 115–118.
Kosack, H. P.: **Antartida Argentina,** [Argentine Antarctic], p. 129–132.

**Royal Meteorological Society, Quarterly Journal,** Volume 79, Number 342, October 1953.

Wormell, T. W.: **Lightning,** p. 474–489.
Mason, B. J. and Ramanadham, R.: **A photoelectric raindrop spectrometer,** p. 490–495.
Goody, R. M. and Walshaw, C. D.: **The origin of atmospheric nitrous oxide,** p. 496–500.
Mason, B. J.: **On the generation of charge associated with graupel formation in thunderstorms** p. 501–509.
Bigg, E. K.: **The formation of atmospheric ice crystals by the freezing of droplets,** p. 510–519
Longley, R. W.: **The length of dry and wet periods,** p. 520–527.
Austin, E. E.: **Upper winds of Aden,** p. 528–532.
Neumann, J.: **On a relation between the annual heat budgets of seas and lakes and other term of the energy equation,** p. 532–534.
Francis, J. R. D. and Stommel, H.: **How much does a gale mix the surface layers of the ocean** p. 534–536.
Cooke, D. S.: **The duration of wet and dry spells at Moncton, New Brunswick,** p. 536–538.
Gregory, S.: **A note on the classification of annual rainfall-distribution types,** p. 538–543.
Scott, J. R.: **On wind analysis in low latitudes,** p. 544–545.
Wallington, C. E.: **A lee-wave scale,** p. 545–547.
Webb, C. G.: **Solar radiation at Singapore,** p. 547–548.
Browne, I. C.; Wexler, R.: **The collection efficiency of ice crystals,** p. 549.
Barratt, P. and Browne, I. C.: **A new method for measuring vertical air currents,** p. 550.
Manley, Gordon: **The mean temperature of central England, 1698–1952,** p. 558–567.

**S. Air Force. Cambridge Research Center, Geophysical Research Papers.**

No. 1. Lettau, Heinz: **Isotropic and non-isotropic turbulence in the atmospheric surface layer.** December 1949.
No. 2. (Classified).
No. 3. Haskell, Norman A.: **Diffraction effects in the propagation of compressional waves in the atmosphere.** March 1950.
No. 4. Anderson, Charles E.: **Evaluation of results of Joint Air Force—Weather Bureau cloud seeding trials conducted during winter and spring 1949.** May 1950.
No. 5. Crary, Albert P.: **Investigation of stratosphere winds and temperatures from acoustical propagation studies.** June 1950.
No. 6. Press, F.; Ewing, M.; Crary, A. P.; Katz, S. and Oliver, J.: **Air-coupled flexural waves in floating ice.** November 1950.
No. 7. Underhill, Bradford B. and Donaldson, Ralph J., Jr. (*eds.*): **Proceedings of the Conference on Ionospheric Research (June 1949).** December 1950.
No. 8. Gerson, N. C. (*ed.*): **Proceedings of the Colloquium on Mesospheric Physics.** July 1951.
No. 9. Haskell, Norman A.: **The dispersion of surface waves on multi-layered media.** August 1951.
No. 10. Elterman, L.: **The measurement of stratospheric density distribution with the searchlight technique.** December 1951.
No. 11. Gerson, N. C. and Donaldson, Ralph J. (*ed.*): **Proceedings of the Conference on Ionospheric Physics (July 1950) Part A.** April 1952.
No. 12. Katz, Ludwig and Donaldson, Ralph J., Jr. (*ed.*): **Proceedings of the Conference on Ionospheric Physics (July 1950) Part B.** April 1952.
No. 13. Donaldson, Ralph J., Jr. (*ed.*): **Proceedings of the Colloquium on Microwave Meteorology, Aerosols and Cloud Physics.** May 1952.
No. 14. Haurwitz, B. and Craig, Richard A.: **Atmospheric flow patterns and their representation by spherical-surface harmonics.** July 1952.
No. 15. Aden, A. L.: **Back-scattering of electromagnetic waves from spheres and spherical shells.** July 1952.
No. 16. Thompson, Philip Duncan: **Notes on the theory of large-scale disturbances in atmospheric flow with applications to numerical weather prediction.** July 1952.
No. 17. Mintz, Yale and Dean, Gordon: **The observed mean field of motion of the atmosphere.** August 1952.
No. 18. London, Julius: **The distribution of radiational temperature change in the Northern Hemisphere during March.** December 1952.
No. 19. Hewson, E. W. (*ed.*): **International Symposium on Atmospheric Turbulence in the Boundary Layer. Massachusetts Institute of Technology, 4–8 June, 1951.** December 1952.
No. 20. Penndorf, Rudolf: **On the phenomenon of the colored sun, especially the "blue" sun of September 1950.** April 1953.
No. 21. Watanabe, K.; Zelikoff, Murray and Inn, Edward, C. Y.: **Absorption coefficient of several atmospheric gases.** June 1953.
No. 22. Haskell, Norman A.: **Asymtotic approximation for the elastic normal modes in a stratified solid medium.** Aug. 1953.
No. 23. George, Joseph J.; Roche, R. D.; Visscher, H. B. et al: **Forecasting relationships between upper level flow and surface meteorological processes.** Aug. 1953.

**eather,** London, Volume 8, Number 9, September 1953.

Lawrence, E. N.: **September in Britain—autumn or summer?** p. 259–261.
Mason, Derek: **Aircraft and icing research—I. II.,** p. 243–246.
Johnson, O.: **Some rapid temperature changes,** p. 268–269.
Henderson, H. C. K.: **Tobias Smollett as a weather observer,** p. 275–278.
Monteith, J. L. and Wilkins, J. W.: **Raising an eyebrow!** p. 279–281.
Sansom, H. W. and Gross, J.: **A strong descending air current at Nairobi,** p. 282.
Dines, J. S.: **A seven-day weather recurrence?** p. 286.

Number 10, October 1953.

Grinsted, W. A.: **Meteorology in the West Indies,** p. 300–301.
Stone, L. H. J.: **The weather of the Bahamas,** p. 301–302.
Twist, T. F.: **Weather of the eastern Caribbean,** p. 303–304.
Fowler, W. J.: **Weather of the western Caribbean,** p. 304–306.
Francis, J. R. D.: **The sea, trade winds and weather,** p. 306–308.

Currie, Ronald: **The Callao Painter,** p. 308–311.
Atkinson, G. Anthony: **Architecture in the trade winds,** p. 313–315.
Chilton, D.: **A recording radar-sonde station,** p. 315–316.
R——, G.: **British Association Meeting at Liverpool,** p. 316–318.
Spink, P. C.: **Ocean network,** p. 320–321.
Potter, J. G.: **May in Canada,** p. 321.

**Weatherwise,** Volume 6, Number 5, October 1953.

Beck, Dean Niels C.: **Foreword to career and education issue,** p. 116–117.
Reichelderfer, Francis W.: **Career opportunities in the United States Weather Bureau,** p. 119, 142, 150.
McKillip, J. C. S.: **A career in the Navy Aerological Service,** p. 120–121.
Senter, William O.: **Air Force weather careers,** p. 122–123.
Ludlum, David M.: **The private practice of meteorology,** p. 124–125.
**Meteorological education in the United States,** p. 126–142.
**A selected bibliography in meteorology. Meteorological periodicals in English,** p. 144–147.
Ludlum, David M.: **The summer droughts,** p. 148–150.

**Zeitschrift für Meteorologie,** Berlin, Volume 7, Number 5, May 1953.

Maede, Hans: **Die Hochdruckwetterlagen im Raume der südlichen Ostsee und des angrenzenden Flachlandes in klimatologischer Betrachtung,** [High pressure situations over the Southern Baltic and the bordering lowland from the climatological point of view], p. 129–146.
v. Kilinski, Erich: **Die neuen Registrieranlagen im luftelektrischen Hause des Hauptobservatoriums in Potsdam,** [New recording equipment in the building for atmospheric electricity at Potsdam Main Observatory], p. 146–150.
Hinzpeter, Hans: **Über die Durchlässigkeit der Potsdamer Normalfilter,** [The transparency of the Potsdam normal filters], p. 150–152.
Wegener, Kurt: **Bemerkungen zur Solarkonstanten,** [A note on solar constants], p. 152–153.
**Die Witterung in der Deutschen Demokratischen Republik, März 1953,** [Weather in the German Democratic Republic, March 1953], p. 155–156.
**Erdmagnetische Kennziffern für die Zeit vom 20. 12. 1952 bis 10. 3. 1953,** [Geomagnetic characteristics for the period Dec. 12, 1952–March 10, 1953], p. 157.
**Endgültige Sonnenflecken-Relativzahlen für 1952,** [Final sunspot relative numbers for 1952], p. 158.

# LIST OF PERIODICALS

**Note:** This list contains the titles of the periodicals which regularly contain material on meteorology or related fields and it comprises only a small percentage of the periodicals from which pertinent articles are abstracted.

In this list the preferred form of title entry is given in bold face type. If the title is distinctive, the name and headquarters of the issuing society or organizations follows the title. If the title is not distinctive (for instance, Bulletin, Journal, Trudy, Mitteilungen), the entry consists of the issuing body followed by the title.

## PERIODICALS IN WHICH METEOROLOGICAL ARTICLES REGULARLY APPEAR

**Académie des Sciences, Paris, Comptes Rendus.**
**Akademiia Nauk, SSSR, Izvestiia, Ser. Geogr.** and **Ser. Geofiz.**, [Moscow].
**American Geophysical Union, Transactions,** National Research Council, Washington.
★**American Meteorological Society, Bulletin,** [Boston].
★**Angewandte Meteorologie,** [Potsdam].
★**Annalen der Meteorologie,** Seewetteramt, Hamburg.
**Annales de Géophysique,** Centre National de la Recherche Scientifique, [Paris].
★**Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A** and **Ser. B,** [Vienna].
**Australian Journal of Physics,** [Melbourne].
**Ciel et Terre,** Société Belge d'Astronomie, de Météorologie et de Physique du Globe, [Brussels].
★**Geofisica e Meteorologia,** Società Italiana di Geofisica, [Genoa].
**Geofisica Pura e Applicata,** Istituto Geofisica Italiano, [Milan].
**Geophysical Magazine,** [Central Meteorological Observatory, Tokyo].
★**Időjárás,** Az Országos Meteorológiai és Földmágnességi Intézet [Budapest].
★**Indian Journal of Meteorology and Geophysics,** [Delhi].
★**Journal of Atmospheric and Terrestrial Physics,** [London].
**Journal of Geophysical Research,** [Washington].
★**Journal of Meteorological Research,** [Tokyo].
★**Journal of Meteorology,** American Meteorological Society, [Boston].
★**Journal Scientifique de la Météorologie,** Société Météorologique de France, [Paris].
★**The Marine Observer,** Air Ministry, Meteorological Office, London.
★**The Meteorological Magazine,** Air Ministry, Meteorological Office, London.
★**Meteorological Society of Japan, Journal,** Second Series, Kisho Shushi, [Tokyo].
★**La Météorologie,** Société Météorologique de France, [Paris].
★**Meteorologische Rundschau,** [Bad-Kissingen].
★**Meteoros,** [Buenos Aires].
★**Monthly Weather Review,** U. S. Weather Bureau, Washington, D. C.
**Nature,** [London].
★**Nimbus,** Sociedad Meteorológica de Bolivia, [La Paz].
**Polarforschung,** Archiv für Polarforschung in Kiel, [Kiel, Germany].
**Revista de Geofísica,** Instituto Nacional de Geofísica, [Madrid].
★**Revista Meteorologica,** Junta Nacional de Meteorología, Montevideo.
★**Rivista di Meteorologia Aeronautica,** Associazione Culturale Aeronautica, [Rome].
★**Royal Meteorological Society, Quarterly Journal,** [London].
**Royal Society of London, Proceedings, Ser. B.**
★**Tellus,** Svenska Geofysiska Föreningen, Stockholm.
**Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia,** [Moscow-Leningrad].
★**Weather,** Royal Meteorological Society, [London].
★**Weatherwise,** Amateur Weathermen of America, Philadelphia.
★**Wetter und Leben,** Österreichische Gesellschaft für Meteorologie, [Vienna].
★**WMO Bulletin,** World Meteorological Organization, [Geneva].
★**Zeitschrift für Meteorologie,** Meteorologisches Observatorium, Potsdam.

★ Indicates those periodicals which are primarily meteorological.

# TABLE OF CONTENTS

Meteorological Abstracts and Bibliography, Volume 4, Number 11, November 1953

Foreword ....
Explanations ....

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

Works of Special Interest .... 12
General Meteorology .... 12
Meteorological Observations and Instruments .... 12
Methods of Observation .... 12
Observational Data .... 12
Instrument Carriers .... 12
Instruments .... 12
Synoptic Analysis and Forecasting .... 12
Artificial Precipitation .... 12
Structure and Physics of the Atmosphere .... 12
Structure of the Upper Atmosphere .... 12
Ionosphere .... 12
Mechanics and Thermodynamics of the Atmosphere .... 12
General Circulation .... 12
Atmospheric Disturbances .... 12
Radiation and Temperature .... 12
Radiation .... 12
Air Temperature .... 12
Soil Temperature .... 12
Sea Temperature .... 12
Atmospheric Pressure and Wind .... 12
Pressure .... 12
Turbulence .... 12
Wind .... 12
Wind Effects .... 12
Upper Air Winds and Vertical Motion .... 12
Aqueous Vapor and Hydrometeors .... 12
Evaporation .... 12
Cloud Physics .... 12
Dew and Icing .... 12
Fog .... 12
Clouds .... 12
Precipitation .... 12
Rain .... 12
Snow .... 12
Hydrometeorology .... 12
Climatology and Bioclimatology .... 12
Climatology .... 12
Climate of Particular Places .... 12
Climatic Changes .... 12
Microclimatology .... 12
Climatic Classification .... 12
Bioclimatology .... 12
Environmental Effects .... 12
Miscellaneous Applications .... 12
Solar Influences .... 12
Visibility .... 12
Optical Phenomena .... 12
Electrical Phenomena .... 12
Radio Propagation .... 12
Acoustical Phenomena .... 12

PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON THUNDERSTORM SFERICS

Introductory Note .... 1
Outline of Contents .... 1
Bibliography on Thunderstorm Sferics .... 1
Supplementary Material .... 1

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS 1

PART IV. AUTHOR AND SUBJECT INDEXES

Index of Authors .... 1
Index of Subjects .... 1
Index of Geographical Locations .... 1

List of Periodicals .... Cov